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A BRIEF HISTORY OF OBSTETRICS AND GYNECOLGY IN VIRGINIA*

PRESIDENTIAL ADDRESS

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OBSTETRICS and gynecology developed in Virginia much as it did elsewhere. The history of this branch of medicine in Virginia serves as a cross-section, the longest cross-section to be sure, of the history of obstetrics and gynecology in the country as a whole. It affords a beautiful example of the reaction of trained men to frontier conditions.

When the first colonists landed at Jamestown in 1607, they brought with them English ideas and English customs. They built homes and gardens as nearly like those in England as circumstances would permit. They imported their fashions and their furniture from England and named the colony after England's great Virgin Queen. Herbert Spencer, in his *Medicine in the Days of Shakespeare,* has given us a good picture of the medicine of those times. Its practice was divided by law and custom between the physician, the surgeon, the apothecary, and the midwife. The physician was usually an aristocrat and a man of learning. He had been educated at one of the old universities and had made the "grand tour" and studied in, or at least visited, the continental medical schools at Paris, Montpellier, Leyden, or Padua. It was easier for a butcher's boy to become a cardinal or a dramatist than a physician. With his classical education, speaking and writing Latin and for the

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For lack of space this address cannot be printed here in full, but may be found in its complete form in the current volume of the Association's Transactions.

most part resenting the use of the vernacular, the physician treated his brethren, the surgeon and the apothecary, with haughtiness and the midwife with disdain.

The affairs of the colony were in the hands of the Virginia or London Company, as it was variously called. Among the subscribers of this company were Dr. Theodore Gulstone, censor of the College of Physicians, and ten other prominent physicians. These medical men were mindful of the health of the colony and were instrumental in sending qualified physicians, surgeons, and apothecaries with the first colonists. The frontier conditions broke down these artificial restrictions in the practice of medicine. Seldom do we find any reference to the old world notions of the rights and prerogatives of the different classes of practitioners. The physicians, ship surgeons, barber surgeons, apothecaries, and even apprentices did what was to be done according to their lights. The midwives alone seem to have their field to themselves, at least for nearly a century and a half.

Dr. Thomas Cullen began his address on "Early Medicine in Maryland" with the following quotation: "In June, 1608, John Smith sets out from Jamestown in an open barge of three tons' burden and with a crew of thirteen, hoping to find a passage westward into the Pacific. The party enters the Patapsco. Walter Russell, gentleman, doctor of physic, accompanies them and writes the history of this voyage." This might be taken as the text of my discourse. In the first place, Walter Russell was a gentleman. In the second place, he was a pioneer. A pioneer might be termed a practical man with an inquisitive mind, in contradistinction to an adventurer or an investigator. In the third place, he met emergencies as they arose. On this very voyage Captain Smith was dangerously wounded by a sting ray, and Russell, the physician, dressed the wound with what he had at hand. In the fourth place, he was forgotten, the fate of most doctors doing often remarkable pioneer work in obstetrics and gynecology in Virginia. Of the 197 Virginia doctors writing upon obstetrics and gynecology, only twenty-two are mentioned in Kelly's *Cyclopedia of American Medical Biography.* Sixteen of those had wartime reputations, fifteen in the Confederate Army and one in the Union.

One is tempted to trace the careers of Virginians who have made names for themselves outside of Virginia, men like Ephraim McDowell in Kentucky, Moses Montrose Pallen in St. Louis, Thaddeus Asbury Reamy in Ohio, Richard Beverley Cole in California, Thomas Ashby and William Travis Howard in Baltimore, Henry Davidson Fry in Washington, Robert Mendenhall Huston, the brothers Mordecai and Joseph Price in Philadelphia, W. R. Pryor, George Tucker Harrison, LeRoy Broun, and Thomas A. Emmet in New York. This would carry me too far afield. Nor will I take up time with a discussion of the many priorities credited to Virginians. The first cesarean section in America in 1794; the first uterine sutures in a cesarean section in 1828; the first

ovariotomy; the first "Dührssen" incisions (before Dührssen was born); the first cure of vesicovaginal fistula; the first metallic sutures; the first immediate repair of the cervix (by the son of a Virginian); the first episiotomy; the first description of puerperal malarial fever, etc. These are no doubt well known to you and are beside my purpose today. Rather would I trace as best I can the kind of obstetrics and gynecology practiced in Virginia from time to time.

For the purpose of description it is convenient to divide the period into two parts, before and after the advent of the man midwife. This took place in Virginia about 1750. A third division suggests itself, that after the advent of the specialist, but as all the Virginia specialists in this field, save one, are still alive, such a section would not properly come under the head of history. According to Blanton, the first evidence of a man midwife was in 1753 when it is recorded that Henrico County paid Gearrard Ellyson one pound for midwifery services. The first medical fee bill makes no mention of obstetrics in 1736.

Our sources of information in the first period are rather meager; chiefly court records, vestry records, and the writings of such men as Colonel William Byrd and Thomas Jefferson. Both were voluminous writers and keen observers. Thomas Jefferson is said to have invented an incubator. Both were interested in sterility. Colonel Byrd records that when an Indian woman does not conceive within a reasonable time after marriage, the husband, to save his reputation, enters into a diet for six weeks. The remedy rarely failed. I imagine this is the first reference to a high protein diet in sterility.

The midwives received various fees. Twelve hens were paid the Widow Hollins (although she sued for eighteen) in 1634. Goodwife Thorpe charged 100 pounds of tobacco. The midwives took care of all the obstetrics in the Colony. It was early the custom for doctors to take into their homes one or two patients. The Surry County Records, for instance, show that George Lee rather reluctantly took Mrs. Richard Hill into his home during her pregnancy, which seemed to have been a complicated one, and also treated her husband, but when she was confined she was attended by two midwives, assisted by two nurses and other women. This practice of hospitalizing patients in physicians' homes may have been the reason why William Baynham, who was the foremost anatomist and next to Physick the leading surgeon in America, remained in Essex County. Several generations later John P. Mettauer developed the idea to such an extent that he filled a little country town with surgical patients and finally established a medical school there.

But to go back to the midwives, not only did they have exclusive control of obstetrics, but the courts also appointed juries of midwives to pass on the question of pregnancy in condemned females. Nor were their activities confined to obstetrics and legal opinions; in 1766, Constant Woodson presented to the House of Burgesses a petition setting forth that she had discovered an effectual remedy for curing cancer which she "for a valuable consideration will communicate to the publick." The

next year the House of Burgesses voted the sum of 100 pounds sterling to said Constant Woodson, provided she produce a certificate as to the efficiency of her cure from under the hands of Theodrick Bland, James Feild, William Black, and Robert Brown or any two of them. There is no record in the Treasurer's office of such a sum being paid, so it is likely that Constant failed to convince the doctors. The only book on obstetrics except James Black's copy of Sharpe's *Midwifery in Virginia* in this period was *Of the Birth of ManKindde*, the English translation of Rösslin's celebrated book for midwives.

There is no way of knowing with any degree of accuracy the maternal or fetal mortality. Both must have been high. Large families were the rule. Mention of the twentieth child is not uncommon in the diaries of the time, which shows that some women at least survived a number of pregnancies. On the other hand many women died young. William Allason's *Letter Books* record that of Mrs. Allason's almost annual pregnancies, only one child, the first, survived the first month, and she herself died early. M. C. Harris has collected for me the records of 44 families before 1750. The data were gathered from family Bibles, tombstones, etc. There were 66 wives, of whom four died shortly after childbirth. Of the 291 children born to these families, five died in infancy. No mention is made of stillbirths. Each wife averaged 4.41 children. An analysis of the section of Burgesses and other prominent persons of Tyler's *Cyclopedia of Biography* gives somewhat similar results, considering the fact that usually only the children who grew up are mentioned. The average number of wives per man was 1.18, and the average number of children per wife was 2.57. (In 689 cases the number of wives are mentioned and their total was 814, and in 459 instances the number of children are recorded, their total being 1,177.)

The first part of the second period is likewise to a large extent shrouded in mystery. The first American cesarean section belongs here. It was performed in 1794 by Jesse Bennett upon his own wife and escaped the profound search of so great a student of cesarean operation as Robert P. Harris. Joseph L. Miller gives a well-documented account of this operation. Bennett later moved to Mason County on the Ohio River, and as the operation was common knowledge there, Miller suggests that it may have influenced Richmond of Newtown, Ohio, who is generally credited with the first cesarean section. Hugh Trout further suggests that it may have influenced Ephraim McDowell. Humphreys of Staunton was a consultant in Mrs. Bennett's case and refused to operate. Humphreys was also the preceptor of Ephraim McDowell, and shortly after the operation was performed, McDowell must have visited Humphreys on his way home from Edinburgh. It is only natural that they should have discussed such an unique operation. A more tangible evidence of the influence that these early American operations had is furnished by Sänger himself. Harris, writing in 1878, recognized and

stressed the importance of early operation. He discussed the question of uterine suture and anesthesia and left these questions open. Sänger, in his classical monograph in 1882, recognized the importance of uterine suture as well as early operation, and in support of his thesis he gives a table of the sixteen American operations in which sutures had been used in the uterus. Interestingly enough the earliest of these was performed by a country charlatan in Virginia whose name is unknown (Harris, Am. J. Obst. 11:620, 1879). It is reported by Weems who witnessed the operation. Other early Virginia cesarean operations are by Brodie S. Herndon in 1845, William G. Smith in 1855, Charles Mills in 1856 and 1867 upon the same patient, and by Edward Drew in 1856, James Parrish in 1875, and by J. T. Boutelle in 1879 and 1880.

It is said that Drelincourt, the teacher of the celebrated Boerhaave, enumerated nearly 300 theories of conception, all of which were believed at one time or another. None of these seemed to have bothered Virginia doctors.

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While they were not much on theory, the Virginia doctors were strong on therapy. John P. Mettauer reported in great detail a case of puerperal fever successfully treated. He was seemingly proud of his prophylactic treatment of puerperal fever for he wrote a number of articles on it. It consisted of (1) purgation a few hours after delivery. Some diuretic such as an infusion of pine tops was also considered useful. The diet, of course, should be restricted. (2) Purging more remotely after delivery. (3) Purging in all cases after delivery. This treatment, however, was not universally accepted.

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An epidemic of puerperal fever that occurred in Mount Solon and vicinity was reported by C. R. Harris in 1852. More than three-fourths of those delivered were attacked. Of the thirty-six patients, seven died. There was one autopsy. The author, nevertheless, did not believe in the contagiousness of the disease.

In 1885 the germ theory, as it was called, had come to the front. I. S. Stone reported a good result in treating a case of puerperal septicemia with intrauterine injections of bichloride of mercury solution 1-500. In the same journal, M. A. Rust had an excellent article on the evolution of antiseptic midwifery. He quoted from the Prussian statistics to show that three-fourths of maternal deaths were due to sepsis, or 1 in 40 confinements. He advised against intrauterine injections, and called attention to fatal cases of bichloride poisoning from that cause. He condemned the routine exploration of the uterine cavity with the hand. He recommended bichloride compresses to the vulva to prevent air from entering the uterus. Walter Izard described a safe method of injecting the uterine cavity, using potassium permanganate solution and a two-way nozzle.

The usual way of controlling serious postpartum hemorrhage was to massage the uterus with one hand within the uterus and with the other hand on the abdomen. In some sections of the State it is still the practice to pack the vagina with a roller bandage soaked in turpentine. In the *Virginia Medical Monthly* there is an account of Hyatt's (Kinston, N. C.) method of controlling postpartum hemorrhage with a rubber bag filled with cold water, and in a subsequent issue, a correspondent writes that Diday used the same method in 1850. "In hemorrhage from abortion, astringents are of no avail." The uterine cavity must be cleaned out with the finger or else tamponed. Harvey Black described the character of pulse that is premonitory to postpartum hemorrhage (frequent and fretful).

In 1791 and 1799 William Baynham operated successfully for extrauterine pregnancy. The first patient consulted him three or four years after a missed labor. She was then in excellent health. He made the diagnosis of an extrauterine conception and advised the patient that she would have to wait the return of a second labor; "that at some future day nature become weary of her burthen, would in some way or other manifest a disposition to rid herself of it." Three and a half years later she was seized with influenza which was then epidemic. The abdominal tumor became painful and continued to be a little troublesome to her until April, 1790. The tumor was then pointing toward the left side, where the integuments were inflamed. He attempted to open the tumor but after making an incision two or three inches he desisted, having neither books to consult nor medical friends to advise with. By January, 1791, it was evident that something must be done to save the woman's life. He determined at all hazards to extract the child. This time he continued the incision deeper and was successful in extracting the fetus in parts. It lay in a separate sac that apparently did not communicate with the peritoneal cavity and was lined with a thin incrustation of osseous matter. The second case was similar but of only eighteen months' duration. This time he did not delay the operation but made an incision over the most prominent part of the tumor, thereby exposing the head of the child. Guided by his finger within the cavity he extended the incision cautiously up and down until it was large enough for him to remove the child. It was of the common size and sound, except on the head where a small part of the scalp was in an incipient state of putrefaction. There was no fluid in the cavity. He did not attempt to remove the placenta. Some pieces were thrown off at almost every dressing, but it was upwards of a fortnight before the string came away. Baynham thought that such cases were not uncommon and went unrecognized. Tragic ruptured ectopics were certainly unrecognized or else did not occur. I cannot find the report of a single case. There was quite an interesting lot of reports of abdominal pregnancies. John A. Cunningham reported the case of an old negro cook who carried a fetus forty years. It was finally discharged through the rectum. H. G.

Leigh reported a case of four years' standing. The patient died of heart disease and at autopsy fetal bones were found in a sac formed by the omentum. George William Semple reported a case in which the diagnosis of metritis was made. The patient passed a uterine cast and was treated for worms (which she had). The extrauterine fetation was diagnosed at autopsy. Hunter McGuire reported a case of missed labor with subsequent pregnancy. The previous tumor then suppurated and fetal bones were discharged per vaginam. He opened the abdomen and removed what was left of a nine months' fetus. The patient died in a week. John Lewis removed the remains of a fetus per anum. Walter Izard successfully operated upon a case of abdominal pregnancy of four years' duration. There was a fistula at the umbilicus. J. R. Godwin had a case with a fecal fistula at the navel and another fistula two inches below and to the left, through which he removed the fetal bones. The patient recovered. Samuel also removed a decomposed fetus from the rectum.

In the *Boston Medical and Surgical Journal* (1840), John P. Mettauer reported a case of vesicovaginal fistula upon which he operated successfully in 1838. Seven years later, he reported two cases in detail and four others, and is convinced "that every case of vesicovaginal fistula can be cured and my success justifies the statement." He used sutures of lead wire. Later he modified this statement as to all cases being curable as he found two in 32 inoperable.

Vesicovaginal fistula came to the front in Virginia medical literature again after the Civil War. Naturally nothing was written on obstetrics and gynecology from 1861 to 1865. The only case of military gynecology is reported in 1867. A young lady was wounded in March, 1865, by a pistol ball, which entered the thigh and passed through the bladder and abdomen. The wound healed with the exception of a vesicovaginal fistula. Fisher of Warrenton operated but was unsuccessful. He took the patient to Emmet who succeeded on the fourth attempt. All save the second operation were done without an anesthetic.

The treatment of eclampsia did not change as quickly and as much as it does today. In 1851, Thomas Pollard reported three cases with one recovery. His treatment consisted of cold to the head, blisters to the nucha, bloodletting, cupping, enemas, and purgatives. "On the use of opium there is some contrariety of opinion." He made the suggestion that chloroform might be useful. If the convulsions do not stop the uterus should be emptied. Veratrum viride made its appearance about 1874 (McCaw, Coleman, Tebault) and shortly afterward chloral hydrate (Harmanson). In 1882 accouchement forcé was first mentioned, Dr. Charles R. Cullen reporting a fatal case. He regretted that he had no instrument with which to dilate the cervix more rapidly.

Dystocia was most frequently due to malpositions. A surprising number of twins with locked heads were reported and several cases of uterine tumors. The cervix gave Virginia doctors a lot of trouble. The rigid

cervix was treated either medically or surgically. Cupping over the lower spine was at one time the favored remedy. Later this was supplanted by chloral hydrate. For a while gelsemium had many users. In 1851 Reynale reported a case in which neither he nor his consultants could find any opening in the cervix. He made an incision two inches long in the cervix and labor continued to a successful conclusion. The outstanding work in this field was done by William A. Patteson. In 1854 he performed what we now call Dührssen's incisions, which he called "vaginal hysterotomy." Later he reported two other cases. William J. Harrison reported a case that was bled twice and in which nauseants were fully tried. He finally resorted to Dr. Patteson's operation. William K. Gatewood also reported a case of this operation.

The perineum did not cause great concern. Certainly very little was written about it. Hunter McGuire discussed supporting the perineum during labor. He considered it useless and fraught with danger. In 1852 R. M. Taliaferro reported a case of rigidity of the soft parts in which delivery was effected after he had made a mediolateral incision in the perineum. The word episiotomy was first used five years later. Taliaferro laid no claim to originality but said that a similar case had been reported "in the last July number of the *London Lancet.*"

Oxytocics were popular, judging from the number of articles published. Four were upon the preparation of ergot. It is interesting to note, in view of the recent work on ergot, that the majority of the preparations contained the watery extract. Nevertheless the clinical reports were not always laudatory. Parker said that it failed to work in 8 out of 10 cases, although Wellford and others disagreed with him. The use of ergot was widespread. It was given by mouth usually, but when the patient was nauseated, the powder was dusted on a blistered surface. In a series of 17 primiparous labors reported by McSherry, ergot was used in 4. In each there was a stillbirth. He lost 10 babies, not counting a hydrocephalic, in the 17 deliveries.

Robert T. Coleman found quinine to be a weaker oxytocic than ergot, and therefore it was to be preferred in the first stage of labor. Dr. Skelton was of the same opinion. Dr. Grammer of Halifax preferred the tincture of mistletoe to ergot.

The forceps played only a small part in Virginia medical literature. In 1856 there is a comment on Dr. Chatard's use of the forceps. Peter Chatard of Maryland in 4,309 obstetric cases used the forceps once in every thirty deliveries. Commenting upon his book of practice after thirty years, Chatard said, "As to the applications of the forceps they are evidently very numerous. The use of this instrument might have been reduced three-fourths, but feeling certain of not injuring the children, and desirous of abridging the suffering of the mothers, I did not hesitate to make use of it." A. M. Fauntleroy's article also has a very modern ring. He quoted statistics from the Rotunda Hospital and from Hamil-

ton to show that as the incidence of forceps operations increased and the duration of labor decreased, there was a proportionate lowering of fetal and maternal mortality. The subject was also discussed by E. M. Campbell and Thomas J. Moore.

Retained placenta was reported six times, five times after full-term labors and once after an abortion. According to Dr. L. Faulkner if the placenta cannot be delivered you had better leave it to nature. "It is better to ground arms in proper time, and see that nature has a fair chance." George S. Minor evidently did not give nature a fair chance for his patient died on the thirteenth day of "irritative fever." P. W. Harper had better luck. He saw his patient twelve hours after delivery. There was an hour-glass contraction of the uterus and neither he nor his consultatant could deliver the placenta. On the second day the patient began to run a fever and on the fourth day began to expel portions of the placenta. On the tenth day the last portion of the placenta was expelled. On the twenty-first day the patient was free from fever. On the twenty-third day she developed a phlebitis in the right thigh and leg which yielded in six days to purging, bleeding, and external applications of saturnine solution. The swelling and concomitant symptoms then visited the left thigh and leg, but yielded to the same plan of treatment.

Between 1859 and 1880 five cases of ruptured uterus and one case of ruptured vagina with the escape of the fetus into the peritoneal cavity were reported. In one case it was stated that ergot had not been used. Preston described a new sign, one that was first described by M. Jolly, a subperitoneal swelling that appeared either above the pubes, in the groin, or in the vagina. Fontaine's description of his case shows us what a country doctor had to contend with. He found the patient in extremis. There was no time for consultation, very little time for consideration. With the willing assistance of two women he did a craniotomy and finally extracted the child. He then "went after" the placenta and found that it was partly in the abdominal cavity. He delivered it manually. He then found a rectovaginal fistula. He locked up the bowels for a week with opium. The patient recovered and the fistula healed.

A discussion of breast conditions falls into three classes: (1) complications of the puerperium, (2) tumors, and (3) interrelationship of the breasts and pelvic conditions. J. B. McCaw praised belladonna as an antigalactic, and James the fluid extract of the leaves of the castor oil plant as a galactagogue. Macon was full of praise of *Phytolacca decandra* in arresting threatened mammary abscess. Iodine ointment was recommended for the same purpose. The use of adhesive plaster in chronic mammary abscess was described by McGuire. Hooker wrote that much of the discomfort incident to lying-in women may be avoided by regular meals of solid food with an avoidance of a free use of drinks.

Ross reported the case of a woman with three breasts. The extra breast functioned during the puerperium, but the nipple was not large enough for the baby to nurse.

In 1866 James Bolton amputated a breast for cancer and was surprised that the wound healed by first intention. A case of removal of an inoperable cancer with caustic was reported by Alexander Harris. Alexander Weddell reported a similar case in which he used chloride of zinc paste. When it recurred two years later the patient evidently considered the treatment worse than the disease, for he could not prevail upon her to undertake it again.

The third category was productive of many queer case reports. Ayler had a case of inveterate mammary neuralgia due to unsuspected uterine version. Harrison cured a case of interrupted menstruation that had been treated unsuccessfully by three doctors, by the application of mustard plasters to the breasts. Dr. Coleman used the same treatment for a case of vicarious diarrhea. The menstruation reappeared and the diarrhea stopped after three days of treatment.

Imperforate vaginae described by Virginia doctors were either congenital, acquired, or deliberately produced. Craghead cured an imperforate hymen with retention of menses by a crucial incision. The case reported by Mettauer required an incision 1¾ inches deep and the introduction of a large bougie formed of wax moulded over a tube, for six months. Riddell reported a case of complete atresia of the vaginal canal and the absence of the uterus.

Cases of atresia following labor were reported by Michie (from Gibson's clinic), Alban S. Payne, and Robert Nelson. In Pendleton's case the atresia occurred in a parturient female.

Dorsey Cullen cured a case of procidentia by elytrorrhaphy. Stone cured a case of complete vaginal prolapse with senile atrophy of the uterus by occluding the vagina completely. Cox produced the same effect with caustic.

Malpositions of the uterus were the source of almost constant discussion. Goodridge A. Wilson complained that hundreds of females were annually sent from the South to the northern cities for the express purpose of being supplied with pessaries made to order. Little condemns the pessary. Bolton and Conway used it with satisfaction. Cunningham, Snead, and Deane condemned its use. G. T. Scarburgh invented a pessary with a flexible stem, and Cunningham exhibited a different type of pessary of his own designing. Charles A. Budd advocated curative treatment of prolapsus uteri by the local application of tannin.

The relationship of retroversion to hyperemesis is shown in a case reported by John M. Upshur. Herbert Claiborne reported a case of retroversio uteri. His patient was two and one-half months pregnant. Upshur also reported a case of prolapse of the uterus during labor. James Dunn did an Emmet's operation for procidentia uteri. Other

cases of procidentia were reported by Herbert Claiborne, Thomas D. Hunter, and F. B. Watkins. J. F. Peebles reported a remarkable case of prolapse of right ovary with retroversion, prolapsus in the first degree, hypertrophy with granular disease of the cervix, leucorrhea, general ill health, sterility for seven years, recovery and subsequent conception, elevatio uteri.

Time does not permit me to even name the various remedies and modes of treatment that were used. The outstanding work in his field was the successful removal of the cervix in a scirrhous state in 1828 by John Strachan.

A long chapter could be written upon menstrual disorders. In 1824 the best remedy for amenorrhea, according to John Fisher, was the application of leeches to the pudenda. Uterine bleeding in a girl fourteen years stopped promptly when Twyman removed impacted feces from the rectum. Equally surprising result was obtained by Claiborn in a case of menorrhagia, when he dilated the cervix with a tent for the purpose of exploring the uterine cavity. But I will not burden you with such out-of-date matters in this day of endocrine therapy.

A great many cases of ovarian and uterine tumors were reported. In 1828 William McDowell reported a novel method for removal of a polyp. In his case the tumor measured seventeen inches in circumference and was attached to the fundus. In order to get at its base he inverted the uterus, which he reposited after the polypus had been removed. This method was afterward used by Professor Maisonneuve of Paris who reported the method as original with him.

Hematuria, cystitis, vaginismus, sterility, hydrocephalus, hydramnion were seldom mentioned in the Virginia literature. On the other hand, a whole museum of monstrosities were reported. Under the title of hemorrhage from the umbilicus, George A. Otis, who is remembered for his *Medical and Surgical History of the War of the Rebellion*, gave an excellent description of hemorrhagic disease of the newborn and of his efforts to stop the bleeding in a fatal case.

Of necessity this presentation has been extremely sketchy. Any one of the subdivisions would have served for an address. I have been forced to leave out whole chapters such as anesthesia, the speculum, and nervous and mental complications. It has been a great pleasure to meet these old Virginia doctors in the pages of medical literature and to know something of their work. They impress one as being an earnest, conscientious, hard-working lot, who were more concerned about their patients' welfare than their own reputations. When viewed from the vantage point of 1935, some of the things they did seem foolish, but one can but wonder if what we do today will appear less foolish in 1999.

In conclusion, I wish to pay my respects to the Virginia woman. My reading has tremendously increased my admiration for her. We ought to have more monuments to our Jane Crawfords.

MEDICAL ARTS BUILDING

MATERNAL MORTALITY AND MATERNAL MORTALITY RATES*

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IN 1931, during the session of the British Departmental Committee on Maternal Mortality and Morbidity, a commission visited Holland, Denmark, and Sweden on behalf of the Ministry of Health to study the conditions governing the maternity services of these countries whose official maternal death rates were greatly superior to our own. The results of this visit are recorded in the Final Report of the Committee.[1] For our present purpose it is sufficient to recall that, while the Dutch figures revealed for that country an obstetric experience superior to that of Great Britain, the methods governing the assignment of the maternal deaths in Denmark and Sweden to puerperal and nonpuerperal categories differed so greatly from our own that it was impossible to establish a comparison on the basis of the official rates of the respective countries. For example, in Denmark eclampsia did not appear under the puerperal heading at all but was embraced with convulsions at all ages and in both sexes under circumstances which effectively concealed its relation to childbearing, while an analysis of the deaths occurring in Gothenburg revealed that the official method of allocation in Sweden reduced the puerperal death rate by about 50 per cent as compared with the system obtaining in England and Wales.

One of the most striking features of the procedure regulating the assignment of the deaths observed in these two countries was the manner in which this function had tended to become stereotyped in the hands of officials and to have passed completely out of the control of the clinicians. We were brought face to face with the somewhat strange phenomenon that deaths, which the obstetricians in their hospital reports had assigned to the appropriate puerperal heading according to the principles governing such hospital records in most countries, were placed by the public official in a category which divested them of their puerperal bearing. Further, both in Denmark and Sweden even the leading obstetricians were in ignorance of the methods which for many years had so regulated the compilation of the national statistics of their respective countries.

We do not intend to infer that the general methods of assignment in these Scandinavian countries were inferior to those of Great Britain. The facts may, however, be held to demonstrate that, where these are based upon systems which tend to disregard the only foundation upon which a scheme of uniformity can be built, namely, that which insists

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upon a common interpretation of the main clinical data, it is vain to expect any comparability as between the maternal rates of the different countries.

It is true that the social and legislative conditions may so vary in different states as to impede attempts at uniformity of treatment. Further, it is true that the rules set up for statistical tabulation by any country are determined by the necessity of presenting the responsible officials with a scheme by which they can, with the maximum of ease and certainty, carry out a selective choice in those instances in which two or more causes of death appear on the certificate. To this must be added the fact that despite repeated international efforts no scheme capable of common acceptance has been devised, with the result that each country has its own more or less arbitrary code. Some countries, the United States in particular, have attempted to secure uniformity by the setting up of detailed international rules for the selective treatment of joint causes, and it would seem feasible to expect that in this way an approximation to comparability should be attainable at least in regard to countries of an equal scale of civilization. Other countries, such as England, with the object of emphasizing reliance of certification and assignment rather than comparability, stress the importance of eliciting the opinion of the certifying doctor and restrict the use of the arbitrary rules to those cases in which such an opinion is either not forthcoming or is unreliable. There are other differences of less significance, such as variations in the definition of a "live birth," which militate against statistical uniformity.

It is unfortunate that the profound discrepancies existing between their methods of tabulation often make it unsafe to attempt to draw from the death rates useful conclusions regarding the obstetric practices and the large scale obstetric experiments of the different nations. In an effort to measure the extent to which the national rates are affected by the varying assignment procedures which we have mentioned, the Bureau of the Census of the United States transmitted a representative group of death certificates relating to the year 1927 to 16 foreign countries and from the corresponding officials in charge of vital statistics obtained for each certificate a statement indicating the assignment procedure to which it would be subjected in accordance with the practice of their respective countries.[5] This test revealed the existence of a divergence which was often considerable. Thus, for example, it was computed that the official maternal death rate of the United States was thereby increased by 15.3 per cent as compared with Sweden, and by 11.3 per cent as compared with France, while it was decreased by 5.7 per cent as compared with Denmark.

A formal address is not a suitable medium for the presentation of statistical tables, and I have refrained from wearying you with figures except so far as these are necessary to the main theme. It is becoming

more and more evident that this question must demand the serious attention of obstetricians so far as the varying experiences of different countries in regard to the care of their pregnant and parturient women offer unlimited opportunities for profitable study to those engaged in the problems of maternity. Under existing conditions such a study is stultified by the fact that the assessment of even the gross clinical data upon which the assignment of maternal mortality is based varies within such large limits. It would seem to be obvious that before uniformity on this plane can be achieved a common international understanding on the part of obstetricians is essential.

Another main factor making for a lack of comparability is to be found in the manner in which abortion deaths are treated. In its statistical aspects this subject occupies such a special position that it can be more suitably discussed apart from the main problems. It is commonly recognized that the usual practice of relating abortion deaths, which now aggregate a considerable ratio of the total of all maternal rates, to the ordinary live birth numerator is unsatisfactory so far as the reference not only fails to convey any measure of the risk to the total of those exposed, but it is open to the objection that by being related to a group with which it is in no way connected it is meaningless and even deceptive. The common practice of thus dealing with abortion deaths in a manner similar to that employed for all other maternal deaths is, of course, derived from the fact that in the absence of a knowledge of the total number of pregnancies they must be related to those pregnancies which alone are known, namely, those registered (that is to live births or to total births). In this way they are treated like those other conditions in which pregnancy is likely to end prematurely and to which, therefore, the same objections apply (ectopic pregnancy, etc.).

It is of the greatest importance that we should recognize, however, that in its magnitude abortion creates a problem of its own and that in the manner of its treatment it constitutes one of the major factors undermining the comparability of maternal rates. We may in general conclude that in proportion as the number of abortions in a community increases, so the total number of births diminishes, and vice versa. From this it arises that, by relating abortion deaths to live births in a community in which the total abortions are increasing, we are year by year relating to a group of diminishing births an increasing number of abortion deaths and thus obscuring the statistical significance of the data. We can most easily realize the meaning of this phenomenon if we conceive of a small community with an annual rate of 2,000 live births and 500 abortions. If we assume that the abortion rate increases by 500 per year, and that 1 death occurs in every 500 abortions, we get the result as shown in Table I.

This extreme example demonstrates at once the statistical fallacy underlying the usual method whereby deaths from abortion are related

to births, and it explains, also, how this procedure vitiates any maternal death rate which includes abortion fatalities. That the general rate may in reality thereby suffer very considerable distortion can be realized when we note that in some communities abortion provides a considerable proportion of the total mortality (Germany, Stockholm, etc.). On the general questions surrounding the influence which abortion exerts on the maternal death rate, Dr. Ida Hirschmann and I are at the moment conducting an investigation, the results of which we hope to publish in the near future.

In the absence of any means of obtaining a knowledge of the total pregnancies, which alone could provide the basis upon which to assess the death rate in those exposed to risk, some observers have pointed to the advantage of the total female population or the total female population between the reproductive ages (fifteen to forty-five) as the denominator on which to estimate the general rate. This method is, of course, open to the objection that the continual shrinkage in the birth rates of most western communities implies a variation in the pregnancy

TABLE I

	TOTAL LIVE BIRTHS	TOTAL ABORTIONS	ABORTION DEATHS	ABORTION DEATH RATE PER 1,000 LIVE BIRTHS
First year	2,000	500	1	0.5
Second year	1,500	1,000	2	1.33
Third year	1,000	1,500	3	3.0
Fourth year	500	1,000	4	8.0

rates from year to year, and therefore a denominator which is as variable and as indeterminate as that based upon live or total births. It has been claimed, however, that this risk is largely eliminated by the consideration that a declining birth rate does not imply a declining conception rate. Genss,[3] indeed, in a statistical study of the Russian problem, has assumed that it is inherently probable that in a modern community the conception rate is static and that any fluctuation in the births is determined by changes in the abortion rate. According to this view intentional restriction of fertility and contraception play a relatively insignificant part in the declension of the birth rate of modern civilized countries. This somewhat startling assumption is naturally incapable of proof though the rapid increase in the abortion death rate of many communities lends support to the view that it may be true in a greater degree than is ordinarily recognized. In some German towns, for example, it is found that the fall in the birth rate is determined almost exactly by the rise in the abortion rate.

We have to admit that there is no satisfactory method of dealing with the abortion problem according to the ordinary statistical procedures at present in use. Meanwhile, it is imperative for us to recognize the

fallacious nature of our present system and, more especially, the fact that its retention strikes at the root of any effort to standardize maternal death rates on an international basis.

MATERNAL MORTALITY

Within recent years the reports which have appeared in Great Britain and in the United States of the analysis of the factors responsible for maternal death have provided us with a considerable volume of new knowledge on these subjects. The Interim Report of the Departmental Committee on Maternal Mortality and Morbidity of the British Ministry of Health (1930) dealt with 2,000 and the final report of the same committee (1932) with 3,805 deaths. Following these there appeared the report on Maternal Mortality in New York City conducted by a committee of the New York Academy of Medicine under the directorship of Dr. Ransan S. Hooker.[4] This was published in 1933 and dealt with all the puerperal deaths, numbering 2,041, which occurred in New York City during the years 1930 to 1932. The Philadelphia County Medical Society[5] in 1934 issued an analysis of 717 deaths occurring between 1931 and 1933 which was carried out under the chairmanship of Dr. Philip F. Williams. The report of the Children's Bureau of the United States Department of Labor on Maternal Mortality in Fifteen States[6] which was published in 1934 is based on a study of 7,537 deaths. Finally, within recent weeks the Department of Health for Scotland has published a Report on Maternal Morbidity and Mortality in Scotland.[7] This is based upon an investigation of 2,527 deaths occurring between 1929 and 1933 and upon an inquiry into the circumstances attendant on 39,205 births occurring in Scotland during the first six months of 1934. This latter inquiry, which introduces an important and novel feature into this class of investigation, was planned with the object of gathering information on the incidence of morbidity and on the factors contributing to sickness and death in association with childbearing and childbirth.

In the mass these six reports have assembled for our study data provided by an analysis carried out by skilled observers of the individual circumstances surrounding the deaths of 18,627 women. It is true that in many instances the data were not sufficient to permit of a precise decision regarding the causal factors. Moreover, the more complete study of the cases instituted by the various committees resulted in the discovery of a considerable inaccuracy in the original certification as to the cause of death. In the New York Report the percentage of this error was 17.8, in the Philadelphia Report 21.6, and in that of the United States Department of Labor 12.6. The discovery of this high incidence of erroneous certification bears out in a striking manner the contention advanced in the previous pages that ordinarily compiled maternal death rates are largely valueless for purposes of clinical comparison.

These reports may with justice be regarded as embodying the first attempts made on an adequate scale to discover the conditions responsible for the relatively high and the disturbingly persistent lethality associated with childbearing and childbirth in the United States and in Great Britain during the past decades. It is not my purpose to review in any detail the findings of these various committees. The problems with which they have to deal are conditioned by the circumstances obtaining in the countries and areas concerned, and these are sometimes so divergent as to make any comparisons difficult and even useless. There are some respects in which the several reports arrive at conclusions which are so similar on matters of supreme importance that they may be regarded as having for the first time thrown up in an unequivocal manner for the guidance alike of the profession and of the public some of the basic causes of the present obstetric impasse of our two countries. It is to these that I desire more particularly to invite your attention.

PREVENTABILITY OF MATERNAL DEATHS

The English, the New York, the Philadelphia, and the Scottish reports addressed themselves especially to this subject and concluded from the facts at their disposal that, of the total deaths examined, 45.9, 65.8, 56.7, and 58.7 per cent, respectively, were due to errors of judgment or of negligence that were preventable. Implicit in all such attempts to assess the extent to which mortality is avoidable is the firm conviction of the assessors that the figures given are minimal and that with a full knowledge of the facts it would have been possible to extract a much larger degree of preventability.

The causes of maternal mortality may be classified conveniently under three headings: (a) Those morbid states, which specially complicate pregnancy, labor or the puerperium, and those associated diseases which add to the risk of the pregnant and the puerperal conditions. (b) The trauma and other surgical risks that accompany ill-advised obstetric interference. (c) Abortion.

Under the first heading we have puerperal conditions, such as the toxemias, the hemorrhages and disproportion, and nonpuerperal conditions, such as heart disease and pulmonary tuberculosis. These various states must always exact a certain maternal toll, although it is, at the same time, well established that where the service is good the risks to life which they imply can be largely eliminated. The different reports deal with the measure in which these various morbid processes cause mortality and with the methods, preventive and therapeutic, by which they can be fought. One of the most inspiring themes running through modern midwifery is the rôle which preventive care is capable of exerting in such conditions. Even where in regard to ultimate causes our knowledge may be defective we know that detection in time can largely allay the danger, albeit it often demands the premature ending of the pregnancy and, it may be, the sacrifice of the child.

The second group of maternal deaths, to which on this occasion I would especially bespeak your attention, we may rightly regard as constituting the greatest challenge to the modern art of obstetrics. By this I mean the case of the young, healthy woman with no obstetric abnormality or at most possessing some condition of relatively minor significance, who is slaughtered on the eve of the event on which all her thoughts to the last moment have been confidently centered. We have no means of estimating with any accuracy the extent to which this, surely the most tragic of all obstetric events, contributes to the maternal death rate, but there is evidence to suggest that it constitutes one of the main single causal factors. Its consideration is the most urgent concern of obstetricians and publicists in that it relates to the most preventable of all maternal mortality.

THE PRESENT ORGY OF OBSTETRIC INTERFERENCE

A study of the British and American reports conveys the impression that one of the most sinister features of modern Anglo-Saxon midwifery is to be found in the extent to which interference with the course of labor is practiced. There is now a considerable body of reliable evidence to show that in at least 90 per cent of all midwifery the delivery is capable of being effected by normal uterine effort. This figure is for most areas probably an underestimate; Plass[8] in this country and Oxley[9] in London have computed that at least 94 to 95 per cent of all deliveries should be normal and spontaneous. These figures may be regarded as expressing within reasonable limits the conditions that apply generally to the United States and Great Britain. At the same time it is not without significance for our present purpose that in some countries with highly developed obstetric services the extent of mechanical interference is even smaller than that connoted by these figures. Thus, in Sweden the interference rate is 3.2 per cent, in Denmark it is 4.5 per cent, while in Holland, which possesses an obstetric service of a high standard, the rate in those areas where it is ascertainable is under 1 per cent.

In sharp contrast with these conservative figures we find that the New York Committee estimated that 20 per cent of the deliveries (69,665 out of a total of 348,310 live births) were operative, and that in this group the total death rate was 10.5 per 1,000 and the sepsis death rate 4 per 1,000, as compared with a total rate for spontaneous delivery of 2 per 1,000 and a sepsis rate of 0.8 per 1,000. One of the most striking facts revealed in the New York Report is the high proportion of the deaths (19.8 per cent of the total) that followed cesarean section. Further, there is evidence that within recent years there has been a marked increase in this operation; in some hospitals this increase was as high as from 500 to 1,200 per cent. The Philadelphia Committee arrived at very similar findings.

The extent of operative interference in England and Wales has so far not been capable of assessment, but it is well known that in these

countries it is one of the most important of all the factors that disturb the safety of midwifery. It is well known that in industrial areas with a poorly organized service instrumental interference is rife. In some practices more than 50 per cent of the deliveries are admitted to be instrumental. Further evidence is revealed in the number of women sent to the large central hospitals suffering from grave trauma after the "failed forceps" operation. There are, moreover, some individual area records which bear on the same question. Thus, during an investigation,[9] with which I was personally concerned, of the obstetric conditions obtaining in a Lancashire town (Rochdale), which for some years had had the highest maternal mortality in England and Wales, it was discovered that one of the main factors was unwarranted or unskillful obstetric interference and that improvement in the service led within a short time to a reduction of the death rate from 8.90 to 2.99 per 1,000 live births. The Scottish Report contains incriminating evidence of a like kind. It states that "in as high a proportion as 24 per cent of all births recorded during the six months' intensive survey delivery was not spontaneous. The majority of these were assisted instrumentally. Among mothers who died the proportion of instrumental deliveries (excluding deaths from abortions, extrauterine pregnancy, and all cases in which pregnancy had not advanced to the seventh month) was high (51 per cent) and, since detailed examination of the death schedules showed (a) that the necessity for interference was often not apparent, and (b) that the general health before and during pregnancy of those mothers whose deaths were attributed to sepsis after instrumental delivery, failed forceps, etc., was well up to standard, it seems fairly obvious that interference during parturition is an important and preventable contributory factor in the total maternal death rate."

While these facts bear unchallengeable witness to the tragic part which unwise surgical interference with the course of labor plays in modern obstetrics, the most convincing evidence is obtained from the low death rates found in those practices in which the service is so organized as to allow that proportion of delivery which is inherently normal, that is, about 95 per cent of the whole, to be protected against this rage for meddlesome "assistance." The obstetric experience of such a country as Holland is illuminating in this connection. Here the most outstanding feature of the maternity services is the emphasis placed on natural labor. Surgical delivery is rare and, further, those patients in whom the delivery is found to be difficult are sent to the hospital to be under the care of specially selected and experienced obstetricians. It is to the existence of a national obstetric service, which protects the normality of labor, that the relatively low maternal death rate of Holland (3.16 per 1,000 live births in 1933) is chiefly due.

The supreme influence of the safeguarding of the normal case on the whole outlook of obstetrics is, further, strikingly revealed in the records

of some large individual practices, which have an advantage not possessed by such national statistics as those to which we have just referred, in that they are capable of closer analytical scrutiny. For the East End Maternity Hospital, which engages in an outdoor and indoor practice in a poor slum of London, Oxley has from time to time published records of great value. For the purpose of this communication he has kindly provided me with a statement of the figures relating to his last 20,060 successive labors. (The hospital does not deal with abortions, and it is for the most part engaged in the care of its own "booked" cases.) Out of this total about 19,000 cases terminated in normal and spontaneous labor, with 1 death due to pulmonary embolism, giving a mortality rate of 0.005 per 1,000. There was no mortality from sepsis! The mortality rate for the entire series of 20,060 deliveries, and including all abnormal and emergency cases, was 16 or 0.7 per 1,000.

It is perhaps necessary to indicate that I do not, of course, infer from these strikingly successful records that the sole factor making for routine obstetric safety is the abstention from unwise mechanical intervention with the course of normal labor. It is obvious that results of this high order are attainable only when the whole service, antenatal, intranatal, and postnatal, is efficient and is capable of dealing adequately both with normal and abnormal cases. It is, also, abundantly clear to any student of the obstetric problem that efficient machinery for one aspect of the service implies necessarily a high standard throughout the various elements, midwife, doctor, specialist, and hospital. My object in directing your notice to these facts is to demonstrate that sound midwifery implies as a necessary corollary a rigid protection of the normal case against the zealous intervention that brings tragedy in its train. Only thus can we hope to rescue modern obstetrics from the indictment on which it stands arraigned before the tribunal of public opinion, namely, the extent to which young and healthy women in the prime of their usefulness to the family and the State are being continually and needlessly sacrificed on the altar of motherhood.

When we pause to analyze the factors responsible for the increasing tendency to interference, the obstetrician is brought face to face with difficulties which are often incapable of being expressed in the ordinary formulas of his art. Indeed, in their nature and their magnitude, these difficulties are so formidable, and they have engaged the serious attention of so many previous and so many experienced observers, that I hesitate to attempt any adequate treatment of the subject.

I cannot, however, refuse this opportunity to invite your notice to one consideration which, as I see it, must be regarded as outweighing all others in importance. This is to be found in the circumstance that the conditions which govern the obstetric arts, on the one hand, of the Anglo-Saxon communities and, on the other hand, of the European countries to which reference has been made, stand out in such sharp contrast, that

it is impossible to evade the conclusion that in each group the factors which have moulded obstetric method and policy have sprung from like origins.

It is sometimes claimed that the widening of the range of operative delivery arises directly from the increased sense of security derived from anesthesia and modern surgical progress and from the influences which education and social change have brought to play on woman's life. It is impossible to deny the operation of these and other agencies of a like nature. At the same time it may be a disservice both to our calling and to the community if we fail to appreciate in the clearest possible way that, although important in themselves, these factors possess a significance which is purely secondary. In this connection we have to note specially that Holland and Scandinavia, though similarly exposed to the influence of modern surgical discovery and to the effect of changing social and economic conditions, have, nevertheless, succeeded to a relatively high degree in protecting their midwifery from being swept along by the surgical stream that within recent decades has increasingly tended to overwhelm the American and British systems.

MAN AND WOMAN MIDWIFE

The somewhat strange phenomenon represented by the existence of two such distinct patterns of obstetric method in modern communities, whose general medical practice is otherwise similar, has a historical background of peculiar interest to the obstetrician. To trace the parting of the ways we have to revert to the eighteenth century and to the conflict for obstetric supremacy which then broke out between the woman and the man midwife. The spirit of scientific inquiry brought to bear on the midwifery of the day by such men as Smellie, William Hunter, and Denman, threw into clear light the crude and often barbarous nature of many of its practices. The awakening which then resulted led, as we know, to a rapid improvement in principles and methods and ultimately to the development of modern scientific midwifery. While both the woman and the man midwife shared in this improvement, in Great Britain the supremacy was wrested from the former and the controlling influence from thenceforth remained firmly in the hands of the male practitioner. It was, indeed, not until within comparatively recent years, with the passing of the Midwives' Act in 1902, that the midwife emerged from the position of unqualified "handy-woman" in which she had been compelled to carry on her work during the preceding ages. In Great Britain the midwife has now by statute obtained a position for herself, although much remains to be done before she can be regarded as capable, by virtue of her training, of fulfilling her highest service or, by virtue of her economic security, of forming an entirely stable element in the maternity machine. In the United States, I understand, the position of the midwife is even more uncertain.

By contrast with the course followed in Great Britain, in the Netherlands, and in Scandinavia, the midwife succeeded from the beginning in maintaining her primary position in the obstetric hegemony. During the eighteenth century, when, in other countries, the supremacy of the man midwife led to the woman practitioner being relegated more and more to the background, in Europe the midwife, by adapting herself to the new progress, succeeded in retaining and consolidating her position. Important schools for the training of midwives were established and in the large midwives' school in Copenhagen we can read to this day the records of a continuous history dating through more than a century and a half and containing an unbroken list of the women who during that period have obtained their instruction within its walls. The large, well-organized and well-staffed schools, where today the pupils are trained intensively during a period of two, and, in Holland, three years, are the culmination of a historical sequence which has firmly entrenched the woman midwife in her present position of authority and responsibility.

Where through many generations a country has depended upon the midwife, whose experience and skill have sufficed for the overwhelming proportion of childbirth, it follows that the art in its essential features must present many differences from that which has grown up round "handy-woman" and doctor. It is inevitable that in the former case the emphasis on anesthesia has been slow to develop, and it is equally inevitable that the whole momentum of the service should be directed toward the encouragement of spontaneous childbearing. Reviewed in this light we cannot fail to recognize that the features of Anglo-Saxon midwifery, which today create so much concern, have evolved as the natural outcome of a history dating back two hundred years and that it is idle to seek for their origin in the ineptitude of the modern doctor or in recent surgical or social developments. With the control and the bias placed where they are, these recent changes have merely operated to encourage, or rather to precipitate, a tendency toward regarding childbirth more and more as a surgical process instead of a physiologic act.

There are several strong advantages inherent in a maternity service which is based on the well-trained midwife. In the first place, this arrangement is the readiest and generally the only means by which it is economically possible to build up the ad hoc machine, with that intimate coordination of all its various elements, which in the opinion of most observers is essential to the solution of the maternity problem. The existence of a band of midwives provides the stable foundation of such a scheme. In the second place, it supplies the economic means of training a personnel specially fitted for the attendance on ordinary natural delivery, constituting, as it does, about 90 per cent of the total. It is impossible to gainsay the fact that the midwife trained, for example,

at the special school at Amsterdam for a period of three years, during which she has witnessed about 1,800 pregnancies and deliveries, is equipped with an experience in ordinary midwifery and a knowledge of the signs of danger, which are denied the students trained at our medical schools. In the third place, the dedication of the life of the midwife to attendance on a function which is essentially natural implies that her outlook is pervaded by the spirit of the normal and the physiologic in contrast to that of the doctor and the ordinarily trained nurse, whose whole training has tended to a preoccupation with the abnormal and the morbid. In the fourth place, the provision for every woman in labor of an experienced midwife implies that certainty of skilled attendance and that consolation and comfort which at such a time a woman can best give. It is one of the most apparent weaknesses of our present system that the laboring woman is often left under the care of an unskilled "handy-woman" and that the contingencies of his practice and frequent inexperience in matters obstetric make the attendance of the doctor often haphazard and unsatisfactory.

In Great Britain today these facts are becoming increasingly appreciated with the result that strenuous attempts are being made to reinstate the midwife in her position of trust and responsibility. The British Medical Association in its Scheme for a National Maternity Service[10] has laid down as one of the essential desiderata the provision of a well-trained midwife for every pregnant and laboring woman. The Committee on Maternal Mortality and Morbidity of the Ministry of Health in its Final Report (page 34) states that they are satisfied that "extension of the employment of midwives in normal cases in this country is an essential condition of a satisfactory service, and they consider that as midwives become better instructed in the matter of antenatal care the routine supervision of pregnancy, subject to the medical examination during that period, may with advantage, be increasingly entrusted to them." As a member of the committees of these two bodies I was in a position to recognize the nature and the force of the arguments which led to their decisions. It is becoming more and more understood that the handing back of the bulk of the maternity of the country to the midwife demands that the period of her training should be greatly lengthened and its nature improved, and it is appreciated, also, that much requires to be done to strengthen her social and economic status.

I have given examples of large practices where artificial interference has been reduced to a figure standing at 5 per cent or even lower. It is significant that in such cases the routine service is in the hands of the midwife. The lesson to be drawn from these and similar examples of large scale maternity services, whether domiciliary or hospital, is that the skilled midwife is the most precious element in the scheme. In my own hospital service with a forceps rate of about 3 per cent the doctor members of the staff recognize the key position accorded to the senior

midwife and appreciate that to her they must look to a major extent for the first indications of trouble. Many hospital obstetricians know that the young and enterprising house doctor is likely, unless guided, to import into the labor ward the heroic surgery to which he has been thrilled in the surgical theater. I always remind such youthful enthusiasm that the great William Smellie in his incomparable *Treatise of Midwifery* published in 1752 says of Mrs. Maddocks that she was "a midwife whom I kept on purpose to attend my patients in lingering labours." Could we have a safer guide?

I may be accused that, in my apotheosis of the midwife and all she will stand for in a rehabilitated maternity service, I have closed my eyes to some of the ancillary and often mutually conflicting problems with which we are all painfully familiar. On most of these questions I must deliberately refrain from touching. There are, however, two, namely, the question of anesthesia during labor and the increasing tendency to hospitalization, to which I must make some reference.

The extension to laboring women of the relief of anesthesia is a humane object which commends itself to all obstetricians. At the same time the legal restriction of this beneficent function to the doctor has implied from the beginning that any attempt to realize its full advantages is attended with not insignificant obstetric danger. The induction of anesthesia in response to the dictates of humanity tends inevitably toward the risk that the doctor, in the higher interests of his patient, may be compelled to hasten the delivery of the child. It has thus happened that under existing conditions anesthesia and natural delivery have come to be regarded often as irreconcilable. There can be no doubt that the present well-intentioned attempts to bring the advantages of anesthesia in greater measure to the woman in labor frequently, tend to fix the doctor still more firmly to the obstetric machine under conditions which are neither satisfactory to himself nor in the best interests of his patient. It is true that this impasse is being gradually dispelled by the increasing reliance which can now be placed upon sedatives, the administration of which is often left in the hands of the midwife, although still under the supervision of the doctor. There are some obstetricians, who have closely studied this problem, who maintain that the full measure of security for laboring women can be attained only when the midwife, by virtue of her training and status, is qualified to achieve emancipation in these as in other matters. This is one of the most urgent obstetric questions of the future. It is a matter of interest that in Holland and, more especially, in the Scandinavian countries the public authorities are becoming concerned that the growing demand for anesthesia may seriously imperil the stability of their present systems.

The increasing recourse to hospital for delivery, which is so common a feature of many modern communities, constitutes another major obstetric problem. In Great Britain this tendency has been specially

prominent since the War, and in the large towns it is so marked that it has completely revolutionized the whole maternity services. The same phenomenon is exhibited by European countries and the New York Report states that during the years 1931 to 1933 over 70 per cent of the confinements occurred in hospitals. How far this change is to be regarded as one which has come to stay or as one which merely expresses a temporary post-war phase, it is yet impossible to say. I cannot discuss in any detail the manner in which it is changing the face of obstetric practice. It is imperative that we recognize that, apart from the risks of epidemic sepsis which are specially aggravated thereby, so far as we are receiving women for mass care, it is incumbent on us to press forward to the creation of a high uniform standard of hospital service and personnel. In some ways the opportunity is thereby being provided for a wholesale uplift in the obstetric work of the country, and, indeed, there are some obstetricians and publicists who maintain that in the encouragement of hospitalization we can alone expect to find salvation.

ABORTION

This constitutes the cause of the third group of maternal deaths which still remains for our consideration.

I have already alluded to the manner in which the rising abortion death rate is creating a problem of great gravity. In modern civilized communities the deaths from abortion comprise a large and, in many cases where the evidence is available, a steadily increasing proportion of the total maternal mortality rate. The New York Report states that between the years 1931 and 1933 abortion caused 21 per cent of the total deaths ascribed to puerperal causes, and that these had increased by 52 per cent over this short period. In the Philadelphia Report abortion is shown as causing 29.6 per cent of the total puerperal mortality during three years. In England and Wales the Ministry of Health returns indicate that abortion in 1930 caused 10.5 per cent of the mortality and that in 1933 this figure had increased to 16 per cent. The abortion death rate tends to be highest in the towns and lowest in the rural areas. Thus, the Registrar-General states that for 1930 the percentage of deaths from sepsis returned as following abortion was 35.1 in London, 24.6 for country boroughs, and 19.0 in rural districts. In Berlin during the years 1922 to 1924 the percentage of the sepsis death rate due to abortion was 81.2, while it has been computed that during the five years 1926 to 1930 postabortion sepsis accounted for more than 50 per cent of the *total* puerperal death rate in Stockholm.

There can be little doubt that the bulk of the deaths following abortion are consequent upon intentional interruption of pregnancy and that the increase is to be attributed to a widespread extension of criminal practices. This is reflected in the high proportion of the total which is due to sepsis. In the New York Report 73.4 per cent, and in the

Philadelphia Report 86.2 per cent of the abortion deaths were ascribed to this cause, while in England and Wales the Registrar-General shows that during the years 1930 to 1932 the percentage was 72.5.

The alarming extent to which willful and criminal interruption of the unwanted pregnancy is responsible for material mortality is a community problem of great urgency. The motive running through what must be regarded as one of the most sinister commentaries on modern life is revealed in its full significance, when we relate it to the problem of illegitimacy. The various reports reveal that abortion constitutes an appallingly high proportion of the puerperal deaths in illegitimate pregnancies. In New York the percentage of the total deaths due to this cause is 44.9, while in Philadelphia, out of a total of 79 deaths in illegitimate pregnancies (giving a relatively enormous illegitimate mortality rate of 20 per 1,000 live births), there were 49 or 62 per cent due to abortion!

I sometimes wonder if as obstetricians we have been sufficiently vocal in regard to the terrible havoc which the practitioners of an illicit art are responsible for spreading throughout our towns, a havoc which, it is admitted, is beyond the power of legal enactments to control. It is surely necessary that the community, which reposes in us the care of its health, should be made to understand the gravity of the present situation. It is true that as a profession we must in our corporate capacity refrain from entering the arena in support of some such State experiment as that introduced in Russia for the legalization of abortion, and thus from assuming to ourselves functions that pertain more to the sociologist and the publicist. The problem has implications of a moral and religious as well as of a social and economic kind which beset any communal effort of this nature. At the same time it is imperative that in the formulation of a policy for dealing with abortion the State should be conscious of the gravity of the medical issues and of the heavy and increasing burden of death and disease which the existing conditions compel it to carry.

REFERENCES

(1) Final Report of Departmental Committee on Maternal Mortality and Morbidity, London, 1932. (2) Comparability of Maternal Mortality Rates in the United States and Certain Foreign Countries. United States Department of Labor —Children's Bureau. Elizabeth C. Tandy. Washington, 1935. (3) *Genss:* Quoted from Fetal, Newborn and Maternal Morbidity and Mortality, White House Conference on Child Health and Protection, New York, 1933, p. 451. (4) Maternal Mortality in New York City, Commonwealth Fund, New York, 1933. (5) Maternal Mortality in Philadelphia 1931-1933, Philadelphia, 1933. (6) Maternal Mortality in Fifteen States, Washington, 1934. (7) Report on Maternal Morbidity and Mortality in Scotland, Charlotte A. Douglas and Peter L. McKinlay, Edinburgh, 1935. (8) *Plass, E. D.:* Am. J. Obst. & Gynec. 22: 176, 1931. (9) *Oxley, Phillips, and Young:* Brit. M. J., p. 304, 1935. (10) National Maternity Service Scheme for England and Wales, British Medical Association, London, 1929.

CLINICAL AND PATHOLOGIC DIFFERENTIATION OF CERTAIN SPECIAL OVARIAN TUMORS*

Granulosa Cell Carcinoma, Arrhenoblastoma, Disgerminoma, Brenner Tumor

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THE purpose of this paper may be set forth very simply. Within recent years attention has been called to a group of ovarian tumors which had hitherto been unrecognized, and which even now are frequently overlooked by pathologists and clinicians alike. Certain members of this group are not very rare, and all are of unusual interest, because they so frequently exhibit biologic properties of great interest, especially in this day of universal interest in problems of endocrinology.

It is difficult to apply any inclusive generic name to this group of neoplasms. Most often they have been referred to as "certain special" ovarian tumors, obviously a meaningless designation, especially in view of the fact that the ovary is so often the seat of other tumors which are "special" in the sense that they cannot be included under such general designations as carcinoma or sarcoma, and which presumably involve some special local histogenetic mechanism. As a matter of fact, it is our ignorance of their histogenesis which makes the classification of ovarian tumors so notoriously unsatisfactory.

The group which will be discussed in this paper includes certain tumors whose origin is linked up with anomalies in the embryologic development of the ovary, so that, in a very broad sense at least, they may perhaps be spoken of as tumors of dysontogenetic origin. The four members of this group which will be considered in this paper are granulosa cell carcinoma, arrhenoblastoma, disgerminoma, and the so-called Brenner tumor.

There is no doubt that many gynecologists and gynecologic pathologists are still much confused as to the clinical and pathologic differentiation of these growths, and it has seemed to us that a simple exposition of their distinctive characters might be well worth while, particularly as so little has been written on the subject in this country. The foreign literature, especially the German, is full of discussions and reports of these tumors, but, with the exception of granulosa cell cancer, only one or two papers in the American literature have concerned themselves with any discussion of the other types. There are, of course, a

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certain number of case reports, but these are not very helpful in fixing in the mind of the reader the distinguishing diagnostic characteristics of these various entities.

In the present summary only the salient points are to be considered, with a minimum of references to the new extensive literature of the subject. The basis for the discussion is the study of a rather considerable group of these tumors, most of them from our own clinical material, but not a few sent to us from outside sources. This material includes 42 cases of granulosa cell carcinoma, 5 cases of arrhenoblastoma, 11 of disgerminoma, and 6 of the rare Brenner tumor. It would seem unwise, within the limits of a single paper, to attempt a detailed report or analysis of our own cases, or a review of the now very large literature. Our purpose is rather a missionary one, that is, to epitomize and crystallize the essentials for the benefit of gynecologists and pathologists who have not become familiar with this mass of newer knowledge concerning the histogenesis, the gross and microscopic characteristics, and the symptomatology of these neoplasms. While many investigators have contributed to their study, it seems only fair, and not invidious, to single out for special credit Robert Meyer, whose studies have done so much to clarify our concepts in this, as in so many other fields of gynecologic pathology. For purposes of brevity and readability, references and citations from other authors have been almost entirely excluded from this paper, though a short working list of recent publications is appended.

HISTOGENESIS AS RELATED TO THE EMBRYOLOGY OF THE OVARY

No intelligent conception of the character and significance of any of these tumors is possible without at least some idea of the normal embryology of the ovary. The anlage of the sex gland, either male or female, is developed on the anterior or ventral surface of the wolffian body. In its early undifferentiated phase it appears simply as a small mass of cells covered by the coelomic epithelium, which in this segregated area constitutes the germinal epithelium. In this undifferentiated phase, when it is impossible to determine by histologic examination whether the gonad is to develop along male or female lines, it contains cells which possess no developmental potency along either male or female lines, so that it is conceivable that rests of these "dis-germinal" cells may later give rise to tumors which exhibit no capacity to modify sex characters, cells which from this standpoint are to be looked upon as "indifferent." This, as a matter of fact, is the prevailing viewpoint as to the origin of the so-called disgerminoma which we shall have occasion to discuss in this paper.

The first indication of sex gland differentiation is in the appearance of cords of cells developing beneath the germinal epithelium, and pushing down toward the hilum. While these medullary cords develop in both sexes, they are permanent in the case of the male, only transient in the

female. In the former they link up with the mesonephric structures, become canalized and develop into the seminiferous tubular structure and the vasa recta of the testis, the wolffian duct itself becoming the vas deferens.

This pro-testicular apparatus, as already mentioned, develops even in the gonad destined to become an ovary, but in the latter it is transient, the medullary columns undergoing atrophy and disappearance, though traces of them are to be seen quite frequently even in the adult ovary, especially in the region of the rete ovarii. The distinctive female histologic characteristics, therefore, are developed over the fossil remains of the male apparatus, which explains why in the region of the rete ovarii cells may persist which retain male capacities, and which may give rise to tumors with distinctly masculinizing tendencies. This, at any rate, is Meyer's explanation of the origin and the biologic properties of the so-called arrhenoblastoma or masculinizing tumor.

The first proliferative wave, just described, so important in the male and so apparently futile in the female, is in the case of the latter succeeded by a second process of proliferation and differentiation represented by the so-called Pflüger tubules. The epithelium making up these cell columns has in the past been thought to be due to the invasive growth of the germinal epithelium into the underlying mesenchyme, but the evidence of recent investigations points more and more to the view that these cells, representing the future follicular epithelium, are formed by a modification of the mesenchyme in loco (Fischel, Plitzer). Still another viewpoint is that both factors are concerned (Higuchi).

In any event, the cell mass is soon trabeculated by mesenchymal tissue growing up from the hilum, and the beginnings of follicular architecture are thus formed, the epithelial cells grouping themselves in clusters about the central germ cells or oögonia. Here again we encounter a possible source of future neoplasm, for rests of unused granulosa cells may persist, being actually demonstrable at times in the ovaries of young children and even of adults. From these rests of redundant granulosa are developed the granulosa cell tumors. Since the occurrence of granulosal tissue presupposes that the female character of the gonad is already established, it is not surprising that the tumors developing from these cells exert upon sex characters the characteristic effect of granulosa cells in general, that is, a definitely feminizing effect.

Finally, in the development of the ovary, as in that of other organs, rests of sexually indifferent cells which have lagged behind the differentiating wave not infrequently persist. The classical studies of Walthard, in 1903, furnished a histologic demonstration of such nests or tubules not only on the surface and in the cortex of the ovary, but also on the surface of the tubes and the broad and round ligaments. It is not rare, in the routine examinations of laboratory material, to observe solid, or partially cystic nests of large clear cells on the perito-

neal surface in these structures. At times, too, especially in the ovaries of young children, tubular inclusions are encountered in the cortex. These structures are here stressed because from these so-called Walthard cell nests there may develop a type of tumor which, as might be expected, is made up of sexually indifferent cells, so that no effect is produced upon secondary sex characteristics of the individual. This is the Brenner tumor, so-called, of which we shall have more to say later.

What has been said represents in very sketchy outline the prevailing viewpoints with regard to the histogenesis of these four types of tumors. They are not urged with any degree of dogmatism, because in most respects they cannot be proved, and yet they conform with what we know as to the histology, life history, and biologic properties of these tumors, so that they afford the best available working hypothesis for their study. It is easy to see how this question dovetails into that of sex differentiation in general, and how possible it is that an increasing knowledge of the endocrine aspects of the latter problem may modify our views of the origin of certain of these tumors.

GRANULOSA CELL CARCINOMA

This group constitutes by far the largest of the four under discussion, and may fairly be spoken of as rather common. For example, we have encountered 42 cases in a series of 300 malignant ovarian tumors (14 per cent). This high incidence, it should be added, is partly explained by the fact that a considerable number of granulosa cell tumors, as well as of other special tumors, are included which were sent to our laboratory for diagnosis, so that the cases are not clinically consecutive, and the above figures do not represent the real incidence of these tumors. Klaften found these tumors to constitute about 10 per cent of a large series of primary ovarian cancers (19 of 188), presumably consecutive. Inasmuch as the granulosa cell tumors have been rather fully discussed in a recent paper from this laboratory (Novak and Brawner), only a short epitome of their characteristics is necessary here.

Clinical.—These tumors may occur at any age, though in our own experience the majority have been observed during reproductive life. They are quite frequent, however, in women beyond the menopause, and may also be encountered in infancy or childhood. The symptoms are those produced by other ovarian tumors, plus certain interesting biologic effects clearly due to the production of estrin by the cells of the tumor. These hormone symptoms are manifested upon the menstrual function and the secondary sex characters. To interpret them properly one must remember the differences in the effects of estrin depending upon the age of the individual. During the reproductive phase the secondary sex characters of the woman are well established, and the organism is well supplied with estrin, so that the addition of a

further supply would scarcely be expected to produce any noteworthy effect upon the sex characters. On the other hand, it would be natural to expect that a persistent overproduction of estrin might influence menstruation, just as the latter is influenced by the estrin overproduction characterizing the so-called functional bleeding cases. As a matter of fact, the menstrual symptoms of granulosa cell tumors are very much like those of the estrin excess seen in the functional cases. Excessive bleeding is most common, though in many cases the amount of flow is normal, and in not a few there may be periods of amenorrhea lasting even many months.

When these tumors, however, affect children or elderly women, in whom estrin production is normally in abeyance, the invasion of the organism by considerable amounts of estrin produces against the now stark sex ground far more spectacular effects upon both menstruation and sex characters. In either children or elderly women bleeding is produced, and this is usually periodic, so that in the one case a precocious menstruation, in the other an apparent reestablishment of the function, is the common result. The bleeding in these cases is the purely estrin-induced type, similar in its endocrine mechanism to the functional bleeding and the so-called anovulatory cycle seen during reproductive life.

Even more striking, in the young child, are the effects produced upon the secondary sex characters; this as a matter of fact, constituting one of the strongest evidences of the direct rôle played by the female sex hormone in the normal production of these sex characters. In the prepubertal age, the production of large amounts of estrin brings about precocious puberty, with accelerated skeletal growth, striking development of the breasts, and the growth of hair on the external genitalia and in the axillae.

In the postmenopausal cases, the two most characteristic effects are uterine bleeding and the production of endometrial hyperplasia. If, therefore, in a case of uterine bleeding occurring long after the menopause, the diagnostic curettage yields a typical endometrial hyperplasia, one may strongly suspect the presence of a granulosa cell tumor of the ovary, even if palpation is negative, as it may be if the tumor is very small or the patient very stout. If, on the other hand, a tumor can actually be felt in such a patient, there is little doubt of its granulosal nature.

That these tumors actually produce estrin is indicated not merely by the extraction of large amounts of estrin from the tumor substance, for this would in itself be inconclusive in the light of recent tumor hormonology. So would the fact that implantations or extracts of the tumor have been shown to produce typical estrous phenomena in castrated animals. But the finding of large amounts of estrin in the blood and urine of children or elderly women is more significant, while the typically granulosal morphology of the tumor cells in most cases justifies the as-

sumption that the tumor actually produces the hormone as does the normal follicle. Finally, the prompt disappearance of these biologic effects upon menstruation and sex characters after removal of the tumors would seem to clinch the matter. Additional proof has been furnished in one or two cases by the reappearance of the symptoms with recurrence of the tumor in the other ovary and disappearance again with removal of the second tumor.

As regards the malignancy of these tumors, the general statement seems justified that while these tumors must be looked upon as malignant, there is marked individual variation in this respect, and the degree of malignancy of the group as a whole is certainly much less than that of ovarian cancers in general.

Pathology.—Granulosa cell tumors may be of any size, some being very tiny, perhaps only a few millimeters in diameter, others being of

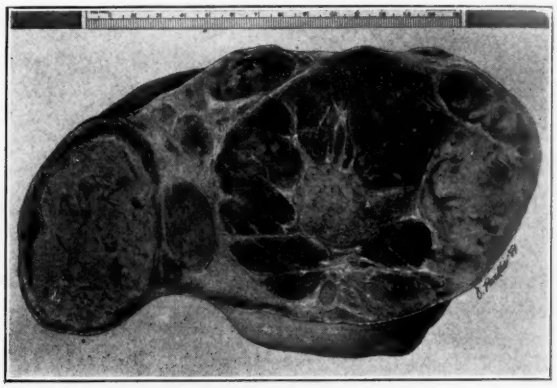

Fig. 1.

enormous size. The most commonly encountered tumors are of moderate size, of ovoid or kidney shape, solid or partly cystic. The cut surface often shows many small cystic cavities, and presents a rather granular consistency. The color is dominantly grayish, but there may be areas of a yellowish hue.

After all it is the microscopic appearance of these tumors which is most important from the standpoint of diagnosis, and this is perhaps the most difficult aspect to set down in black and white. The chief reason for this is the fact that the morphology and architecture of these tumors is so protean. This has led to their subdivision into many different types, and some of these vary so pronouncedly in their microscopic appearance that it is difficult to convince the casual observer that they belong to one and the same family.

In the most commonly encountered variety, the diagnosis can be readily made on the basis of the morphologic identity or resemblance of

the cells to the well-known granulosa cell, and their common tendency to arrange themselves in small clusters or rosettes, sometimes incomplete and horseshoe shaped. There is likewise a tendency, especially in the diffuse types, to cystic degeneration, with the production of tiny

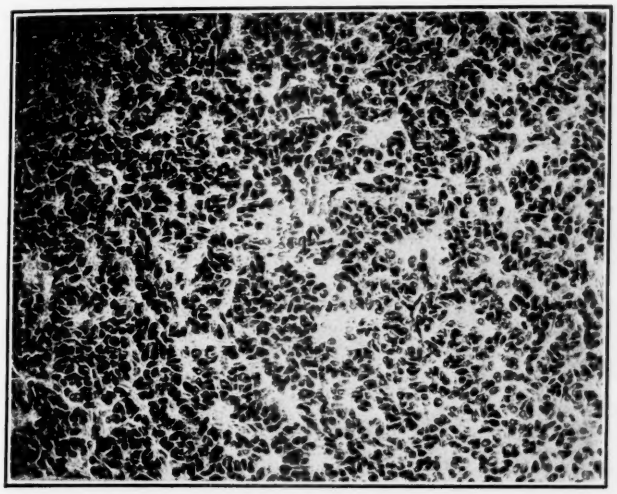

Fig. 2.

Fig. 3.

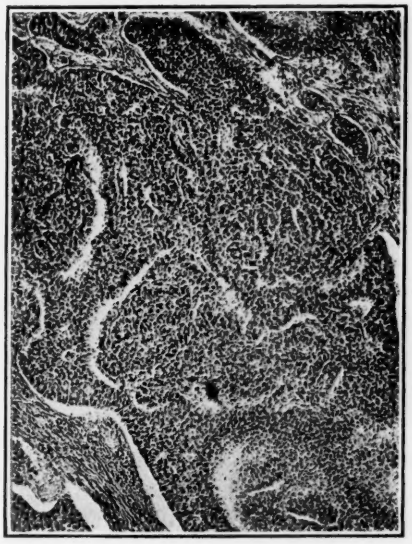

Fig. 4.

or somewhat larger cavities suggesting the Call-Exner bodies seen so characteristically in the granulosa of many animals, such as the rabbit.

To this general diagnostic point we must add the fact that the connective tissue elements play an important part in modifying the pat-

tern and in the production of various subtypes, which in the past have been mistaken for other tumors. The connective tissue may be very abundant, and it shows a strong tendency to hyalinization and liquefaction. The splitting up of the fields of granulosal cells into cylinders or columns by connective tissue trabeculae produces the so-called cylindromatous type, formerly often diagnosed as cylindroma of the ovary or endothelioma. In the same way the convolutions and the liquefaction of the connective tissue may give rise to the gyriform or the adenoma-like varieties of the tumor.

None of these forms, however, are difficult of recognition to anyone who has had the opportunity of studying even a comparatively small material, especially as one soon learns other identifying features, such as the frequent palisade-like arrangement of the cells in long columns or strands. Nor is there any great difficulty, as a rule, in the diagnosis of the type often alluded to as folliculoma malignum. In this, large scattered globular collections of cells may be seen, which because of central degeneration may bear a superficial resemblance to follicles. As a matter of fact, this central degeneration may bring about an ovum-like appearance in the interior of these cell masses, though there is no disagreement now that cystic liquefaction is responsible for this simulation of ova within follicles. In some cases the liquefaction is so extensive as to produce large cystic cavities. From the standpoint of microscopic diagnosis, the folliculomatous variety must be distinguished from a totally different tumor, the oöphoroma folliculare or Brenner tumor, though the differentiation is commonly easy, as we shall later discuss.

More difficulty may be encountered in the recognition of those types of granulosa cell cancer in which there has been a marked departure from the characteristic morphology of granulosa cells. It cannot be too strongly stressed that the examination of as many sections from as many areas of the tumor as possible is of the greatest importance in the study of all these cases, for the widest variations are encountered in individual tumors, and it is rare not to find telltale evidence of the true nature of the growth in some area or other of its extent.

From what was said in the early part of this paper as to the probable origin of the granulosa epithelium from the ovarian mesenchyme, it is not surprising that many tumors present areas which are quite typically sarcomatous, and which to all intents and purposes, are sarcomatous. Almost always the true nature of the tumor can be determined by the study of other fields or sections, it being quite common to find in one and the same section elements which are typically epithelial and elements which are typically of connective tissue character. In our previous paper we have elaborated upon this intermutability, which we think is explainable on embryologic grounds, and which we believe furnishes adequate grounds for including all these varieties

under one head. This applies even to the so-called "thecoma," which Löffler and Priesel, Melnick and Kantner, and more recently Geist have stated should be considered a separate variety of tumor. In the discussion of Geist's paper at the recent meeting of the American Gynecological Society one of us (Novak) took issue with this viewpoint, especially because of the common origin of granulosa cell cancer and thecoma from the same tissue, the ovarian mesenchyme. It was also suggested that a better name for the entire group would perhaps be "progranulosa cell cancer."

There are many other aspects of this tumor group which invite discussion, such as the small but interesting group in which partial or even complete lutein-like transformation of the granulosa cells appears to have taken place. We have recently studied two additional cases in which parts of what were unquestionably granulosa cell tumors showed this lutein-like transformation of the cells. We have discussed this particular point in our previous paper, and shall not elaborate on it here. We may add that the reprints of this previous paper (though not the paper as abbreviated for publication) contain illustrations of the various types which have been described, so that only a few will be included in this paper, in spite of the fact that slides have been utilized in illustrating all the types for this presentation.

ARRHENOBLASTOMA

Contrasted with the feminizing type of tumor is a group which produces the opposite effect of defeminization and even actual masculinization of greater or lesser degree. The logical starting point in the study of this variety of neoplasm would seem to be the case reported by Pick in 1905 and designated as "adenoma ovarii testiculare." This growth was originally explained by Pick as representing an adenoma developing in the testicular portion of an ovotestis, but Meyer has objected to this explanation because there was no history of intersexual manifestations before the development of the tumor. The studies of Meyer have led him to assign to the testicular adenomas of the type described by Pick a place in a group of tumors of widely differing histologic structure, but all tending to produce defeminizing or masculinizing effects.

At one end of the group are these highly differentiated testicular adenomas. At the other are the highly undifferentiated group, which resemble sarcoma, and in which only careful search will reveal any evidence of epithelial tubules. Between the two extremes is Meyer's intermediate group, in which the nature of the tumor is usually readily discernible because of the presence of varying numbers of tubules and acini. The more undifferentiated the tumor type, the more constant the biologic effects above mentioned, while in the testicular adenoma only one-third of the reported cases have produced any degree of masculinization change.

The view accepted by most authors as to the origin of these tumors is that they arise from undifferentiated cells in the region of the rete ovarii, cells which have retained an unused potency to develop along male lines, so that the resulting tumors produce the male sex hormone and thus bring about their characteristic effects. It is obvious that this theory cannot be considered as proved, but it furnishes a good working basis in the study of these tumors. Other explanations which have been suggested, like that of Halban, seem to have been pretty well disproved. As I have already stated, however, this problem seems to be intimately bound up with that of sex differentiation and intersexuality, and our knowledge of both of these is still relatively meager.

In addition to the usual signs and symptoms of ovarian tumors, these neoplasms produce varying degrees of effect upon the sex characters.

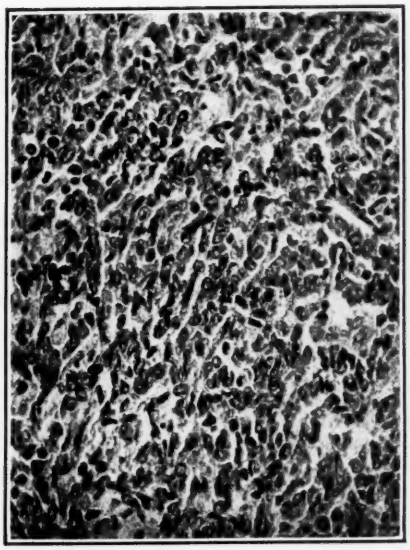

Fig. 5.

Fig. 6.

In the milder syndrome there may be only such defeminizing phenomena as amenorrhea, and decreased size of the breasts, with perhaps some loss of the subcutaneous fat which rounds off the feminine figure, so that a more angular contour is produced. Often there is in addition a greater or lesser degree of hirsutism, with a heavy growth of hair on the face, abdomen, chest, and extremities. Parenthetically, it should be emphasized that the significance of hirsutism as a masculinization phenomenon in women is anything but clear, for extensive hairy overgrowth may be observed in women who menstruate normally, who bear many children, and who otherwise are typically feminine. As this point has been more fully discussed in a recent paper by one of us (Novak), it will not be elaborated upon here.

In association particularly with the undifferentiated types of arrhenoblastoma, evidences of positive masculinization are commonly added to those of defeminization. The voice becomes heavy and masculine, the body contour and even the skeleton may become masculine, and the clitoris may exhibit marked hypertrophy, even to penis-like proportions. That these phenomena are actually due to the presence of the tumor is indicated by their disappearance after removal of the growth, though some residue of symptoms may be left.

In addition to a case of our own which has been previously reported by Novak and Long, we have had the opportunity of studying tissue, usually many blocks, of three other cases of this rare tumor. The size of the tumors is very variable, and they have been unilateral in all reported cases. While they are solid, they frequently show extensive degeneration, which may result in the formation of many small or large cystic cavities.

The rare testicular adenoma should be easy to recognize because of its resemblance to the normal seminiferous tubule structure of the testis. We have seen no case of this variety. In the other varieties one sees large fields of sarcomatous appearance, but in the intermediate group there is no difficulty in finding the tubular structures which give the clue to diagnosis. In some cases these are well marked, with wide lumina, in others they appear as small, almost indiscernible lumina, while in still other areas one may see zig-zag solid cords of cells which are reminiscent of the early sex cords. In a few cases, as in two of those which we have studied, one finds cells which resemble and perhaps are interstitial cells, although the confusion between these and the chromaffin or paraganglion cells at times seen in the ovarian hilum makes such an interpretation uncertain.

DISGERMINOMA (SEMINOMA)

This neoplasm, the seminoma of the French authors (Chevassu) and the "grosszellige Karcinom" of the Germans, is being reported with increasing frequency, possibly because its pathologic recognition is comparatively simple. This, in turn, may be explained by the fact that its microscopic structure is not subject to the protean variability which characterizes the other neoplasms of this general group. It is only about one-third as common as the granulosa cell cancer. The designation applied by Meyer, disgerminoma, would seem a very fitting one in view of his explanation that these tumors arise from cells which have strayed off from germinal paths and potencies in an early undifferentiated phase of ovarian development. Tumors arising from such disgerminal and sexually indifferent cells would be expected to exhibit no influence upon sex characters, and such is the case.

Until recent years, however, there was considerable confusion on this point, because of the fact that disgerminoma is so frequently encountered

in pseudohermaphrodites and individuals with poorly developed gonads. As Meyer has pointed out, however, the intersexual manifestations in such cases are not due to the presence of the tumor, for they are present from birth, and do not disappear after removal of the tumor. In this respect there is a crucial difference between disgerminoma and arrhenoblastoma, which likewise may be associated with intersexual manifestations. In the latter case, however, the tumor arises in individuals who previously have been quite normal, and the sex character abnormalities disappear with the removal of the tumor.

A large proportion of disgerminomas, however, fully 35 of 64 cases tabulated by Fauvet, have occurred in individuals with presumably normal sex development. As a rule the patients are young, usually below the age of thirty, although the tumor has been noted at as late as fifty-two

Fig. 7.

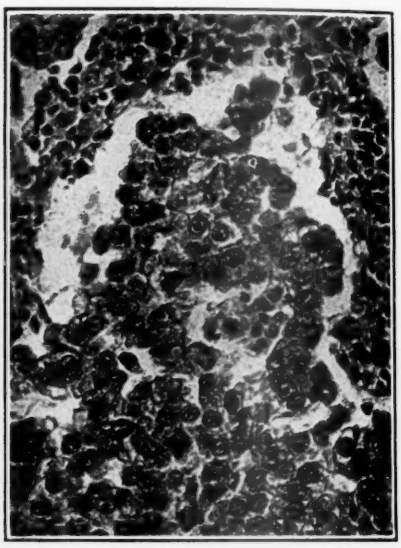

Fig. 8.

years (Fauvet). The size of the tumors is very variable, and they may reach enormous size, filling most of the abdominal cavity. They are characteristically solid, though areas of degeneration and hemorrhage may be seen. The consistency is often doughy. In their earlier stages they are well circumscribed though often lobulated, but when they are large they tend to become infiltrative, invading the uterus, bladder, and other viscera.

The microscopic diagnosis is usually not difficult, for the histology is fairly stereotyped, as already stated. The constituent cells are rather large, round, or polygonal, with clear cytoplasm and large nuclei. They have a characteristic tendency to arrange themselves in alveoli and columns separated by light, or at times, substantial trabeculae of connective tissue infiltrated with lymphocytes. There is a pronounced

tendency to degenerative change, and areas of hemorrhage are often seen. The tumors are unquestionably malignant, but the degree of malignancy, like that of other members of this general group, is certainly less than that of ovarian cancer in general. As compared with granulosa cell cancer, recent reports by Klaften and others would seem to leave little doubt that, taken as a whole, the disgerminoma is the more malignant tumor. While this paper includes no discussion of treatment, it may be added that the disgerminoma, like the granulosa cell carcinoma, is definitely radiosensitive, so that certainly in the advanced stages, where there is likely to be extensive infiltration and therefore incomplete operation, postoperative radiation is always indicated.

BRENNER TUMORS

Finally, brief reference may be made to the so-called Brenner tumor, first described by Brenner in 1907 under the name of "oöphoroma folliculare," and at first incorrectly confused with the granulosa cell tumors. Even now this mistake is sometimes made, though there is little excuse for it, because of the fact that both the clinical and the pathologic characteristics of the two neoplasms are quite different. As mentioned in the early part of this paper, the histogenesis of the Brenner type of tumor is believed to be from the so-called Walthard cell nests found not infrequently on the surface or in the cortex of the ovary. The cells in these rests are apparently of an "indifferent" type, and when they occur in the form of solid nests, like clumps of squamous epithelium, they resemble closely the nests of cells so characteristic of the Brenner tumor. Walthard, in his original paper, stated that the tubular or acinous type of rest may exhibit a mucoid transformation, and this likewise fortifies the belief that such cell collections may explain the histogenesis of Brenner tumors, for, as we shall see, a mucoid type of epithelium is often observed in these growths.

It is chiefly in elderly women that the Brenner tumor has been observed, though there are some exceptions. The symptoms do not differ from those of ovarian tumors in general, no such special biologic effect being attributable to the tumor cells, as is seen with the granulosa cell carcinoma or the arrhenoblastoma. The real nature of the growths, therefore, is not determinable until the pathologic examination is made. While the tumors are rare, there is no question that they are more frequent than the literature would lead one to expect, for their real nature is often overlooked, as we shall presently discuss. They are essentially benign, only one instance (Tavildoroff) of recurrence having been noted.

Until recent years the term Brenner tumor referred only to solid growths, usually rather small, and characterized by nests and columns of large, clear, uniform cells, in a stroma which is markedly hyperplastic, so that it often appears extensively fibromatous. Often there is a mucoid or colloid liquefaction of the epithelial cells, so that there may be a

simulation of follicles with ova. This, indeed, was the interpretation accepted by many of the older writers, as indicated by the designation "oöphoroma folliculare." Whether solid or cystic, however, there should rarely be any difficulty in distinguishing this type of tumor from the granulosal variety. The morphology of the cells is quite different, and their uniformity much more striking than in the granulosa cell carcinoma, in which one so commonly sees evidence of pronounced nuclear activity, such as mitoses. Even the cylindromatous type of granulosa cell tumor is quite different in appearance, while it is rare, if many sections are studied, not to find areas presenting the finely folliculoid, clusterlike arrangement of the granulosal cells. There are still other points of distinction, such as the one emphasized by Meyer, concerning

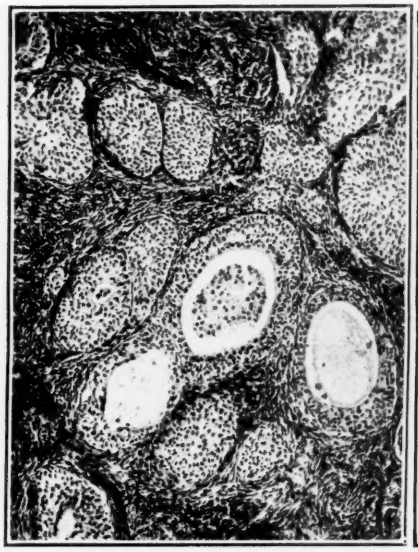

Fig. 9.

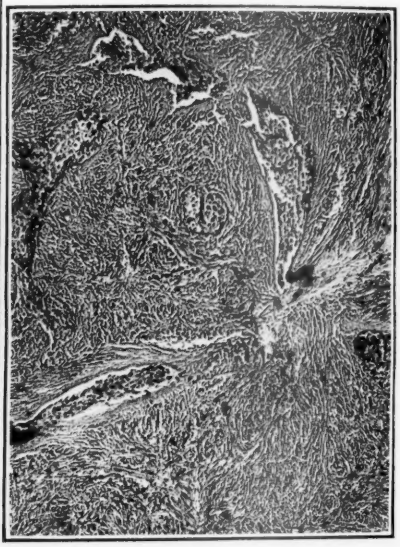

Fig. 10.

the characteristic centrifugal position of the nuclei of the cells surrounding the small cystic areas, as distinguished from what might be called a centripital position in the granulosa cell growth.

While the epithelial elements were formerly looked upon as the all-important features of these growths, it has been recognized within recent years that the stromal fibrosis may come to dominate the picture, with the production of fibromas of even large size. Careful study of these fibromas, however, will always reveal the telltale epithelial elements which stamp the tumor as of Brenner origin. It is this extension of the concept of Brenner tumors, as a matter of fact, that has excited the greatest recent interest, and the studies of Meyer, Frankl and others have changed our viewpoints not only on the potentialities of Brenner tumors, but also on their relation to certain other ovarian tumors.

Not only, therefore, may the Brenner tumor occur as an isolated solid tumor, but it may be submerged in a fibroma, often partly cystic. Many such cases have already been reported, mostly under Frankl's designation of fibroma ovarii adenocysticum. This term is not fancied by Meyer, as it stresses the stromal rather than the more characteristic epithelial elements. To Meyer, too, we are indebted for the observation that the epithelium of the Brenner nests may undergo pseudomucinous differentiation, so that it exactly resembles that of the well-known pseudomucinous cystadenoma. As a matter of fact, one type, though not, of course, the most common one of pseudomucinous cystadenoma originates in Brenner tumors. In such cases the cystadenoma will reveal in some part of its wall a dense hardened area which on microscopic examination is seen to be a Brenner tumor. Not only pseudomucinous, but also serous cystadenomas may thus arise from Brenner tumors, because of the varied differentiating possibilities of the epithelial rests from which these tumors arise.

It will thus be seen that our concept of Brenner tumors must be greatly broadened, so as to include not only the pure type of solid tumor, but also the type associated with cysts of one type or another, often so large that the Brenner tumor is almost completely submerged. The study of cystadenomas must, therefore, include a proper consideration and search for this factor, which is so easily overlooked.

SUMMARY

From the very broad field so briefly and incompletely summarized in this paper, we may select a few points of especial interest and importance to the gynecologist and the pathologist, viz:

1. The granulosa cell carcinoma is relatively frequent, and, since its recognition is usually not difficult, there should be a sharper lookout for it in laboratories of pathology than has hitherto been the case.

2. While precocious puberty may be due to various other endocrine lesions, the occurrence of this syndrome in association with an ovarian tumor should at once lead to the suspicion of granulosa cell tumor, and this suspicion will usually be proved correct.

3. When curettage in cases of uterine bleeding occurring in women long after the menopause yields a typical endometrial hyperplasia, a granulosa cell carcinoma should be suspected even if, as in very stout patients, it cannot be felt. If a tumor can be palpated, the suspicion becomes almost a certainty.

4. During reproductive life, the symptoms produced by granulosa cell cancer, aside from those of ovarian tumors in general, are like those characterizing the more common type of hyperestrinism. Menstruation is usually excessive, often irregular, sometimes normal, while long periods of amenorrhea are not uncommon.

5. While in most cases the microscopic examination of granulosa cell cancer can be made from the morphology and the growth characteristics of the granulosal cells, many cases will be overlooked unless one is familiar with the many patterns produced by the connective tissue changes and by the apparent intermutability of the epithelial and connective derivatives of the progranulosal ovarian mesenchyme.

6. Arrhenoblastoma should always be suspected if an ovarian tumor is demonstrated in a woman who, though previously of normal feminine type, has exhibited symptoms of defeminization or actual masculinization.

7. Disgerminoma, on the other hand, often occurs in sexually subnormal or pseudohermaphroditic patients, though the tumor has nothing to do with the production of such manifestations, which do not regress with the removal of the tumor, as is the case with arrhenoblastoma.

8. The Brenner tumor of the pure or solid type is readily recognizable, but it must be remembered that the same histogenetic factor is concerned in the more and more frequently reported fibroma ovarii adenocysticum, as well as in at least a small proportion of serous and pseudomucinous cystadenomas.

9. The usual block or two made from ovarian tumors for pathologic study is often not sufficient for a proper evaluation of their real nature. With many tumors, such as those discussed in this paper, the study of sections from many parts of the tumor is always desirable, and often absolutely essential if a proper pathologic interpretation is to be made

DISCUSSION

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—One is inclined perhaps to disagree with Dr. Novak that these tumors are frequent and with the implication that they are easily understood and easily recognized. If one endeavors to classify the ovarian tumors by the plan that is now being accepted, many interesting difficulties will arise. This has been my experience with the collection in our museum of 275 ovarian tumors. The number belonging to this special group discussed by Dr. Novak was relatively small.

These tumors have been designated clinically the endocrine group. Their complete study takes one into genetics, cytology, ontogenetics, embryology, histopathology, and clinical pathology, so, for interpretation, one has to develop a very considerable and substantial background in order to rightly appreciate these tumors. If one follows the rule of proceeding from the general to the specific, better bearings are obtained to approach this difficult subject.

Seven granulosa cell tumors have been studied in our series of 275 ovarian newgrowths obtained from a pathologic service of 12,000 surgical and autopsy cases in Wayne University's affiliated hospitals. The histopathology of these cases does not vary greatly although in one case the stroma is very abundant. The granulosa cells in the other cases vary somewhat in their assembling. In most instances single cell cords prevail with here and there a few rosette or follicle differentiations. In one case the cylindromatoid pattern is prominent. The sarcomatoid arrangement prevails in certain local fields of different sections. The best pattern of the normal granulosa cell for type comparison to the tumor form has been observed about atretic follicles.

But one case of arrhenoblastoma is found in our series and the history is unsatisfactory and the architectural characteristics are not completely convincing. Taylor states that up to June, 1933, only 26 cases had been reported. (Surg. Gynec. Obst. 56: p. 1040.)

The hormone influence in malignancy of the ovary is most interesting. Does the estrogenic substance when excessive and combined with hereditary factors dispose to malignancy in Müller's tract and the mammary glands, or is it tumor tissue function that causes estrogenic excess?

The group of tumors discussed by Dr. Novak owe their production in all probability largely to defective chromatin which is germ cell linked, but appears anatomically in deficiencies of the gonadal soma cells, physiologically and pathologically in the endocrine system and in gonadal tumor formation.

DR. HENRY SCHMITZ, CHICAGO, ILL.—Rowntree and others, some years ago, described tumors which had the same effect of masculinization in females as the arrhenoblastomas. Probably these tumors arise from an inclusion of undifferentiated gonad cells in the early stage of the development of the embryo, so much so that in the suprarenal tissue an inclusion of either male or female sex cells occurs which later on give rise to these masculinizing tumors. Hence if tumors are not found in the pelvis one should think of the suprarenal glands.

DR. NOVAK (closing).—Dr. Davis speaks of the rarity of these tumors. This applies to most of the types I have discussed, but not to the granulosa cell variety. The figures given in my paper, of which I have been able to give only a short synopsis, indicate that something like 10 per cent of primary ovarian cancers belong to this group, so that they cannot be considered rare. Next most frequent are the disgerminomas. When pathologists learn to recognize these various types of special ovarian tumors, they will be reported with far greater frequency. Brenner tumors, for example, have commonly been overlooked or wrongly diagnosed, usually as granulosa cell cancer. As Dr. Davis says, and as I emphasized in my paper, blocks should be made from as many parts of the tumor as possible.

To explain the sex differentiation anomalies associated with arrhenoblastoma, I do not believe it is necessary to assume the inclusion of suprarenal tissue in the ovaries. As a matter of fact, aberrant suprarenal tissue is almost never found in these organs. A more rational explanation lies at hand in the intimate embryologic relationship between the suprarenal cortex and the ovarian medulla. The two "anlagen" are adjacent and practically continuous, so that it is not strange that tumors of the suprarenal cortex and certain tumors of the ovarian medulla, the arrhenoblastomas, produce closely allied effects. Finally, as I have mentioned in this paper and more fully discussed in a previous one, hirsutism per se is not to be looked upon as unquestioned evidence of masculinization, though often seen in association with other more distinctive manifestations. It is not rare, however, to find even extensive hirsutism in patients who otherwise are typically feminine, who menstruate normally, and who perhaps bear many children.

SUBPHRENIC COLLECTION OF LIPIODOL FOLLOWING INJECTION INTO FALLOPIAN TUBE WITH OBSERVATIONS ON REVERSE GRAVITATION OF PELVIC EXUDATES AND THE GENITOPHRENIC SYNDROME IN WOMEN*

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THAT fluids in the abdominal cavity tend to gravitate into the pelvic basin has long been recognized. Fowler's position was designed to favor drainage toward the depth of the pelvis where the exudate might become localized.

The possibility that infective fluids arising from disease of the female pelvic organs may take an upward direction and reach the diaphragm has not been generally realized.

A. H. Curtis[1] described adhesions upon the anterior surface of the liver resembling "violin strings" which he believed were the result of an acute attack of gonorrheal salpingitis. According to Curtis these suprahepatic adhesions are unique. Despite careful search throughout the abdomen, no other adhesions were found by him in these cases.

Nonsuppurative subphrenic inflammation has received scant reference in the literature since Neuhof's[2] publication in 1912. It was followed in 1915 by Lee's contribution on subdiaphragmatic inflammation. Lee[3] reported a small group of cases presenting "a syndrome of signs and roentgenographic findings of which the most plausible interpretation seems to be that an inflammatory process of unknown etiology may be situated below the diaphragm which does not go on to suppuration but which recovers spontaneously."

In Neuhof's second report (1915),[2] he corroborated Lee's findings and concluded that the clinical pictures described by Lee and previously by himself were identical. Neuhof gave Lee credit for calling attention to the fact that more obscure foci than a diseased appendix, gallbladder, etc., may be the source of the subphrenic infection. Fifteen years later Curtis' paper appeared in which he pointed out the etiologic connection between the adhesions on the anterior surface of the liver and gonorrhea.

The manner of extension of the infection from the pelvis to the peritoneal surface of the liver was not so clear. Curtis suggested two explanations: (1) That the infection may spread along the peritoneal surface of the ascending colon and (2) that "possibly gonorrheal disease produces a generalized peritoneal infection, beyond the confines of the pelvis more frequently than has heretofore been assumed." Hilliard Miller[4] in his discussion mentioned two other possible channels, namely, the retroperitoneal lymph route and the portal vein.

The present paper is particularly concerned with the manner in which pelvic infection and fluids arising from the female genital or-

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gans may gravitate toward the diaphragm, and there produce lesions and symptoms which together may be termed the genitophrenic syndrome.

CLINICAL OBSERVATIONS

Although gonorrhea is the most common pelvic infection in women, there are undoubtedly effusions which arise from a severe nonspecific pelvic peritonitis of sufficient volume to extend to the upper abdominal fossae. Rupture of a pyosalpinx of any nongonorrheal origin may cause the pus to reach the diaphragm; also ruptured ovarian cysts. These patients as a rule have been in the recumbent posture shortly before the attack or are forced to bed immediately after.

Extravasation to the diaphragm of blood from a ruptured ectopic pregnancy was described by Behan[5] in 1914 and later by Dawes,[6] Herzfeld,[7] and others. Behan's observation with respect to the sudden onset of severe shoulder pains was unknown to me when I published my own observations in 1923. Repeated observations by many since then have confirmed that symptom-complex. But all were agreed that it was the presence of large amounts of blood within the abdomen extending from the pelvis to the diaphragm which was responsible for the pains in the shoulders.

However, the adhesions described by Curtis may be provoked by small effusions. Coincidental epigastric and shoulder pains may also be produced by pelvic exudates of inconsiderable amount.

The opportunity to make direct observations as to the actual extent and amount of exudate poured out during the acute stage of pelvic gonorrheal infection is seldom available nowadays because operations are rarely done for this condition when the diagnosis is clear, and mild attacks require no operative intervention. Therefore in most cases one has to depend upon clinical signs and symptoms.

A recent experience with a case of acute pelvic gonorrhea enabled me to note the clinical signs and symptoms from shortly after the onset to the complete subsidence of the attack. At the very beginning, pain was referred to the gallbladder region and to both shoulders. Muscular rigidity and tenderness were generalized but were most marked in the lower half of the pelvis. Both adnexa remained swollen and fixed after the fever and signs of irritation had subsided. The patient was not operated upon.* In this case I felt that the fluid exudate undoubtedly reached both subphrenic spaces provoking the subcostal and shoulder pains. On the right side, the attack simulated biliary colic; on the left side the "perisplenitis and perigastritis" if present were less characteristic, the pains referred to the left shoulder

*This patient was operated upon Oct. 2, 1935, eleven months after the acute onset of her pelvic disease. Both adnexa were completely embedded in adhesions involving the broad ligament and sigmoid.

pointing to the presence of an irritating process. The amount of fluid exudate poured out from the tubes in this case remains uncertain, but it would not be surprising to find a copious amount extending directly and continuously from the pelvis to the diaphragm.

Another observation in a case of early ectopic pregnancy has thrown some light on the amount of fluid adequate to produce phrenic symptoms.

The patient was twenty-three years old and was married but three months. Her menses had been habitually delayed. A general surgeon who had seen her first, made the diagnosis of appendicitis. When I saw her the symptoms and signs of tubal pregnancy were not characteristic. However, the expulsion of a decidual cast gave the first clue of pregnancy which was confirmed by a positive Aschheim-Zondek test. Tenderness without a palpable mass in the right fornix suggested extrauterine pregnancy. Two attacks of mild syncope, to which the patient paid slight attention, and shoulder pains with the presence on the right side of the uterus of a small mass which developed during the observation of the patient over a period of four days, made the diagnosis certain.

At laparotomy the right tube was found swollen to the size of a thumb; there was no rupture, only a slight amount of blood having seeped through the fimbria into the pouch of Douglas, the vesicouterine space and along the lumbar gutters. The smallest amount of blood was scattered in the lower abdomen directly under the hypogastric incision.

This case was especially instructive because it demonstrated the fact that the shoulder pains may be produced by a small amount of fluid blood under the diaphragm and that the pregnant tube need not be ruptured.

The reproduction of this symptom-complex is susceptible of demonstration in two other ways which have the force of clinical experiment. Both are methods employed in tubal diagnosis.

1. In tubal insufflation, the CO_2 gas rises to the region of the diaphragm to some extent when the patient is in the recumbent position and totally when she stands up (Fig. 1). Depending upon the amount of gas insufflated into the peritoneal cavity, the patient becomes aware of epigastric and subcostal pain while she remains upon the examining table. When the amount is small, not more than 20 to 50 c.c., only the mildest shoulder pains are produced and become evident when the patient stands up. If the volume of gas exceeds 150 c.c., epigastric and subphrenic pains are present in both postures. These symptoms are only transitory, the CO_2 gas being absorbed within a relatively short time. The pain reactions vary not only with the amount of gas but with the patient's sensitivity. A slight amount of CO_2 may provoke disproportionate pain in one patient while a much greater amount may be borne well by another. In general, however, the right subphrenic space is more sensitive.

Another significant observation occasionally made with tubal insufflation may be mentioned in this connection. I have noticed that

in some cases although the tubes are freely patent and there is no evidence of pelvic adhesions, the gas fails to produce shoulder pains and no subphrenic pneumoperitoneum is visible in either subphrenic space. It is difficult to explain this failure to produce a subphrenic pneumoperitoneum except on the basis of an obliteration due to suprahepatic and possibly perisplenic adhesions. In such cases either the tubes have undergone satisfactory healing or there was some other type of subphrenic exudate not originating in the pelvis.

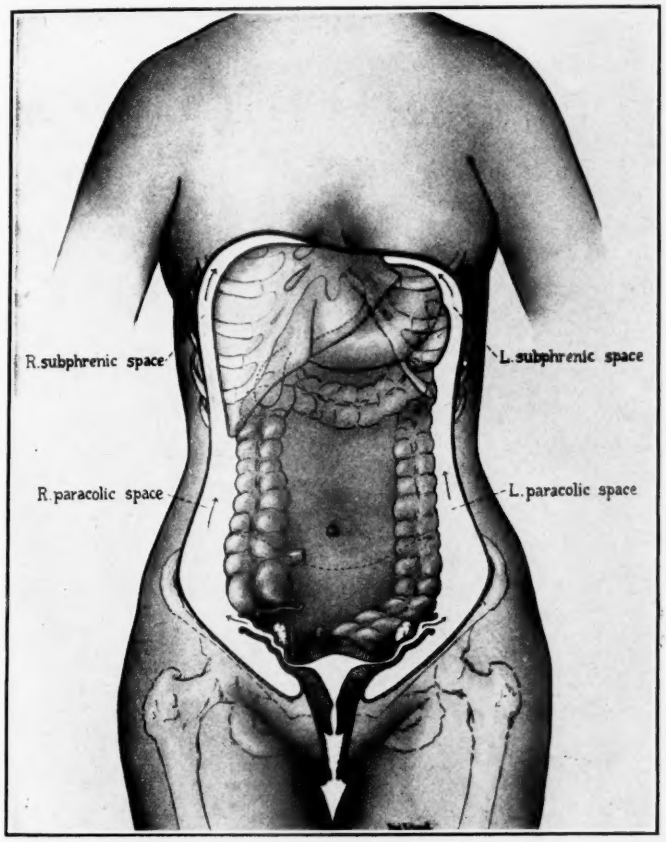

Fig. 1.—Diagrammatic illustration showing the paths taken by infective exudates and innocuous fluids arising from the female pelvic viscera in their upward extension toward the diaphragm.

In some instances of adherent and strictured but patent tubes, a left-sided subphrenic pneumoperitoneum is produced, but it is not possible to displace the gas from the left to the right subphrenic space. In these cases I was forced to assume the presence of adhesions between the diaphragm and the liver. As tubal strictures usually indicate a terminated pelvic infection, the absence of a right-sided subphrenic pneumoperitoneum following CO_2 insufflation points to subphrenic adhesions not otherwise suspected in the patient's history.

2. The escape from the tubes of lipiodol is especially comparable to the discharge of serous and purulent exudates. Regarding the amount of exudate necessary to permit its passage upward from the pelvis, an accidental observation with lipiodol injection has proved most valuable.

In February, 1931, I had occasion to inject lipiodol into a fallopian tube during laparotomy. The next day a skiagraph showed an appreciable collection of the radio-

Fig. 2.—Skiagraph of patient showing left-sided subphrenic collection of lipiodol and similar shadows in the pelvis following injection into the left fallopian tube (one month after the lipiodol injection).

opaque fluid under the left diaphragm. The history of the case is as follows: The patient, S. S., twenty-six years old, was married five years. Three months after marriage, she had a nine weeks' spontaneous miscarriage followed by a curettage. Since then she has been unable to conceive. The menstrual periods were normal except for an amenorrhea of one year's duration following this curettage. Her fallopian tubes were tested elsewhere by insufflation in 1929 and 1930 and were found closed. Her husband was proved to be potent. Pelvic examination revealed

the uterus turned to the left, somewhat enlarged and slightly fixed. The adnexa were not palpably enlarged. A third insufflation which I did Feb. 20, 1931, confirmed the diagnosis of closed tubes. She was operated upon Feb. 25, 1931, at the Beth Israel Hospital.

At operation, both tubes were found moderately dilated and markedly adherent to the ovaries and broad ligament. There were no signs of acute inflammation. Both

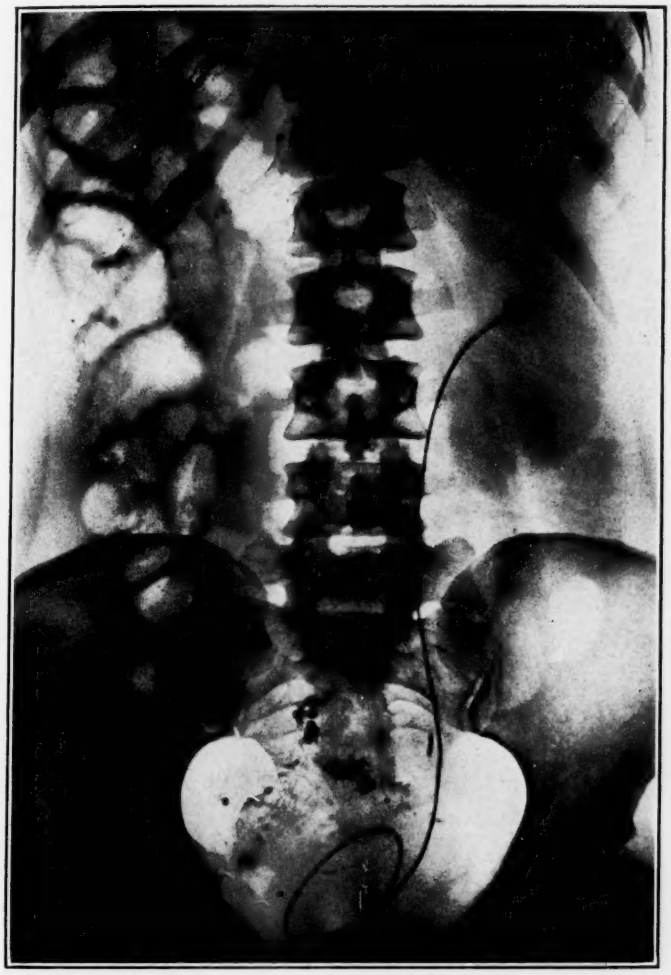

Fig. 3.—Skiagraph of the same patient three months later, an opaque ureteral catheter identifying a right renal calculus. The subphrenic collection is still marked; the pelvic lipiodol residue is somewhat less conspicuous.

fimbria were closed and puckered in. As the right ovary was completely cystic, it was removed with the corresponding tube. The left tube and ovary were freed from their adhesions, the ovary being more firm than cystic. The left fimbria were "milked" open, the newly formed stoma becoming wide enough to allow the passage of a number 14 French catheter into its lumen. Owing to the presence of slight oozing occasioned by mechanically freeing the fimbria, lipiodol was injected into the tube instead of air. The tube was seen to distend with the oil, as far as

the angulated portion of the isthmus, beyond which it did not pass. After dividing the constricting adhesions, the oil passed through. During the injection, however, the tube ruptured at one point near the divulsed fimbria causing the escape of lipiodol into the pelvis. The amount of lipiodol used was 15 c.c.

As the pelvis was packed off from the rest of the abdominal cavity by several abdominal pads, probably very little lipiodol gravitated at once toward the diaphragm. This point is especially mentioned since it may be reasonably assumed that the Trendelenburg position would otherwise favor seepage of the oil toward the subphrenic spaces. Lipiodol was used instead of air or colored fluid to demonstrate whether the left isthmus was rendered patent because it was supposed or hoped that the oil would prevent the formation of adhesions at the newly opened abdominal end of the tube.* A small amount of lipiodol was later recovered from the vagina, indicating that the oil had been forced through the strictured portion of the tube.

An x-ray film of the abdomen taken the next day revealed lipiodol shadows scattered throughout the pelvis streaking up in the region of the paracolic gutters. Both subphrenic spaces were occupied by a collection of lipiodol which was more conspicuous on the left side. One month later, the lipiodol shadows were still seen in the pelvis and under the diaphragm (Fig. 2). Incidentally, a calculus was demonstrable in the right kidney (Fig. 3). The calculus was subsequently removed. Lipiodol shadows were noted in 1934, three years after the operation. The amount of residue in the left subphrenic space was considerably diminished.

The subphrenic collection described above would have escaped detection were it not for the accidental circumstance that the technician happened to take a film of the whole abdomen and not of the pelvis alone. As the usual procedure in x-ray diagnosis of tubal patency by lipiodol or any other iodine oil injection is to take films only of the pelvis, the spread of the oil above the pelvic brim often fails to be noticed.†

Since this experience I have had the opportunity of checking the presence of lipiodol shadows above the pelvis in a number of instances after the oil was injected by others, shortly after or some months following the intrauterine injection. Lipiodol shadows were occasionally found in the region of the kidneys where they were mistaken for calculi by the roentgenologist who happened to be unfamiliar with the history of the case. In a few there were lipiodol shadows in the lumbar gutter and occasionally a small collection was seen under the diaphragm.

As the amount of lipiodol employed for salpingography is usually less than 15 c.c., in spite of which some oil finds its way to the upper abdomen, it suggests the possibility that in a similar manner a small amount of serous or purulent exudate in the pelvis may be sufficient to find its way along the abdominal gutters to the upper fossae. The extension to either side of the diaphragm is favored by the outpouring

*Whether lipiodol can prevent adhesions in diseased tubes remains problematic. From later observations the contrary appears to be true.

†This persistence of lipiodol in the subphrenic space which it reached from the pelvis served to indicate the great advantage of CO_2 gas in the diagnosis and treatment of tubal sterility, but it is not my purpose to enter into this matter here. It moreover suggested the possibility that lipiodol might be found in the abdomen above the pelvis in other cases where the tubes were patent and the amount injected was less than 15 c.c. Such indeed has actually been found to be the case.

from the corresponding tube as has been noted in a previous publication[8] though this does not necessarily always follow. Nor is the Trendelenburg position necessary for the fluid to gravitate toward the diaphragm. The absence of adhesive peritonitis elsewhere may be due to the fact that the exudates are ultimately collected more abundantly in the subphrenic spaces where they are arrested and where the adhesions become more or less fixed. The rhythmic suction action of the diaphragm may account for the adhesions assuming the "violin string" variety. It is quite possible that these adhesions are ultimately resolved. They were not present eleven months after the initial attack of peritonitis in the case of acute pelvic gonorrhea described above.

SUMMARY AND DISCUSSION OF THE GENITOPHRENIC SYNDROME

The data accumulated so far point to lesions in the pelvis being capable of producing pain in the upper abdomen and the areas above, especially the shoulder girdle. Large extravasations as observed in ruptured tubal pregnancy cause the pain in the diaphragmatic areas by sudden impact or shock upon the terminal nerves of the diaphragm and the marked displacement of the liver. In such cases the blood may occupy, for the most part, the pelvis, hypogastric fossae, the lumbar gutters, and the subphrenic spaces. Small extravasations may, however, extend upward along one or both paracolic fossae and reach the diaphragm where pain may be elicited by a similar type of irritation. The nerve terminals of the diaphragm appear to be exceedingly sensitive to the presence of any foreign body including gas or air. Capps and Coleman[10] have shown that slight pressure on the peritoneal surface of the diaphragm can set up pain of great intensity in the neck. They were able to demonstrate this experimentally by producing artificial pneumoperitoneum in some cases and in a few cases of spontaneously induced pneumoperitoneum as in ruptured gastric ulcer. By passing a silver wire through an abdominal trocar they succeeded, under fluoroscopic guidance, in irritating specific points of the parietal surface of the diaphragm and noting the corresponding areas sensitized in the shoulder girdle. It is of interest to mention in this connection that the air which they used would produce shoulder pains if the patient were allowed to stand up. In the recumbent position the referred pains are sometimes absent even though the volume is large.

Infective fluids may be assumed to be at least as irritant and may reach the upper abdomen from the pelvis in the same way as blood or gas. The exudate need not be large as has been demonstrated by lipiodol in amounts of 15 c.c. and less. The recumbent posture is sufficient to allow the fluid in this position to gravitate, as Coffey has

pointed out, to the region of the kidneys which lie on a lower plane than the brim of the pelvis. The tubes are frequently found near the true brim of the pelvis when pus escapes from them.

Although the natural tendency for the pus is to drop into the deep pelvic basin, some of it may also find its way upward along the

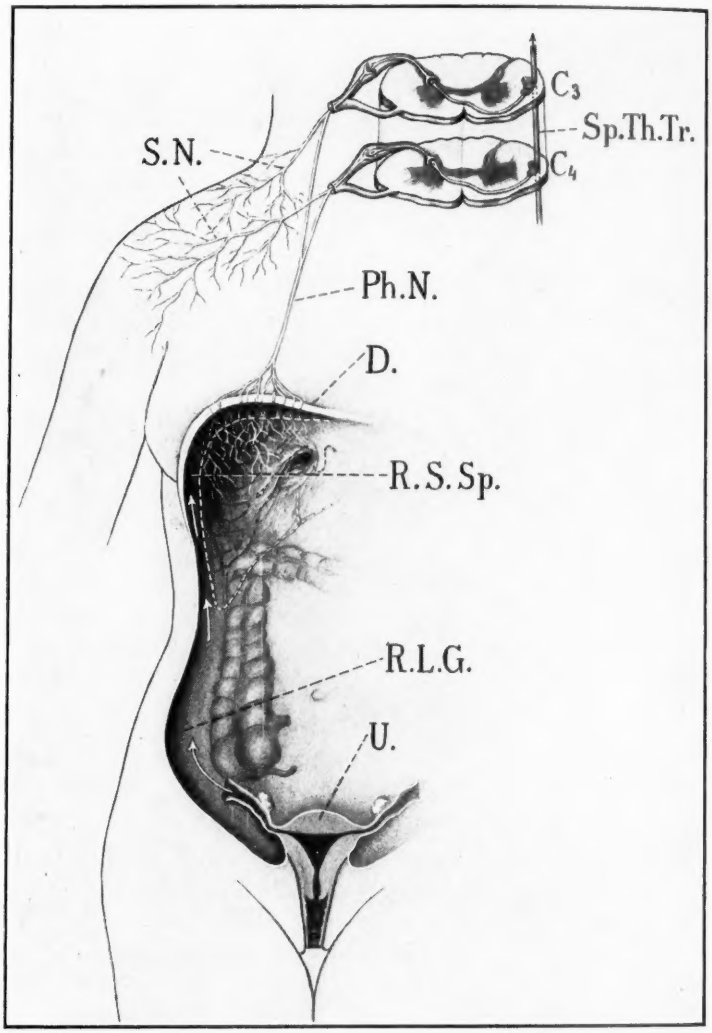

Fig. 4.—Diagram illustrating the genitophrenic syndrome in women. *C3, C4,* Third and fourth cervical segments of the spinal cord. *Sp. Th. Tr.,* Spinothalamic tract, *S. N.,* Supraclavicular Nerves. *Ph. N.,* Phrenic Nerve. *R. S. Sp.,* Right subphrenic Space. *R. L. G.,* Right lumbar (Paracolic) gutter. *U.,* Uterus.

ascending and descending colon. This is especially the case when the tubes are elevated near the brim of the pelvis. To what extent such factors as specific gravity, viscosity of the exudates, osmotic tension in the abdomen, and fluid currents influence this gravitation cannot

be entered into at the present time. However, the size, form, mobility, and position of the sigmoid obviously influence the distribution of effusions arising from the tubes. The position of the cecum probably influences the escape upward from the right side of the pelvis. Larger effusions may ascend on both sides although originating from one adnexa. The exudate may spread upward on the opposite side only, owing to the presence of preexisting adhesions which act as barriers on one side or the other. In the absence of such adhesions, the exudate as a rule tends to follow the nearest abdominal gutter and reaches the corresponding subphrenic space.

The symptoms produced by reverse gravitation of infective fluids are pain in the right or left subcostal space or in both and are frequently referred to the gallbladder and the shoulders. Irritation of the diaphragm is conveyed via the phrenic nerves to the third, fourth, and fifth cervical cord segments from which arise the nerves supplying the shoulder girdle (Fig. 4). Salmon[9] has called attention to dilatation of the pupil in ruptured tubal pregnancy and traces the effect via the same nerves. Pain in the right shoulder is frequently and more commonly noticed by the patient and by the physician. The right half of the diaphragm appears to be more sensitive than the left half and pain referred to the right shoulder is usually more sharply experienced under identical conditions as has been observed in thousands of tubal insufflations.

This is easily demonstrable by placing the patient on her left side and compressing the right ribs, thus converting a left-sided into a right-sided subphrenic pneumoperitoneum, and then comparing the pain reactions. Apparently the gas is more completely imprisoned between the diaphragm and the liver than between the latter and the stomach and spleen causing greater stretching of the falciform ligament.

The symptoms comprising the genitophrenic syndrome in women are as a rule met in acute conditions when they are traceable to their pelvic source. Whether chronic pelvic conditions produce this symptom-complex cannot at present be definitely stated. The fact that the symptom is manifested in anatomical areas as remote from the pelvis as the diaphragm and the shoulders, and even the pupils, should not be understood as a secondary effect of a focal infection. The extension is direct and intraperitoneal and reaches as far as the diaphragm where pain is radiated along the distribution of the phrenic nerve and may simulate subphrenic visceral disease and pulmonary and pleural disease as well. The symptoms disappear with the subsidence of the pelvic lesion which may be spontaneous or follow as a result of surgical intervention. So close is this pelvic-phrenic connection that one has to think of it in all instances (except local trauma)

where pain radiates from the epigastrium to the shoulders. The rest of the history and physical examination are important differential aids in identifying the true nature of the lesion and its location.

REFERENCES

(1) *Curtis, A. H.:* J. A. M. A. **94:** 1221, 1930; **99:** 2101, 1932. (2) *Neuhof, Harold:* Surg. Gynec. Obst. **14:** 231, 1912, and J. A. M. A., July 19, 1915. (3) *Lee, Roger:* J. A. M. A. **64:** April 17, 1915. (4) *Miller, Hilliard:* J. A. M. A. **99:** 2101, 1932. (5) *Behan:* D. Appleton & Co., 1914. (6) *Dawes, H.:* Zentralbl. f. Gynäk. No. 37, 1922. (7) *Herzfeld, B.:* Zentralbl. f. Gynäk., March 31, 1923. (8) *Rubin, I. C.:* J. A. M. A. **80:** 1050, 1921. (9) *Salmon, U. J.:* Am. J. Obst. & Gynec. **28:** 241, 1934. (10) *Capps, J. A., and Coleman, G. H.:* An Experimental and Clinical Study of Pain in the Pleura, Pericardium, and Peritoneum, New York, 1932, The Macmillan Co.

MASSIVE BLOOD TRANSFUSIONS DURING ABDOMINAL OPERATIONS*

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BLOOD transfusion has been used in a great variety of medical and surgical conditions and discarded in many of them as of little or no benefit, but it has always been conceded that it is of undoubted value in cases of hemorrhage. As hemorrhage plays an important part in the production of shock, transfusion is particularly valuable to the surgeon.

After going through the evolution of the various methods of transfusions from direct suture of artery to vein to the syringe methods with 2- to 4-way valves, and also the indirect method of Lewisohn with the use of sodium citrate, it was evident that regardless of the method used, it required skill and accurate technic, with careful attention to detail, to be consistently successful in the transference of large amounts of blood. It is often desirable that transfusion be done during operation or immediately afterward, so that the surgeon finds it inconvenient to carry out the transfusion himself, especially when one is doing a number of consecutive operations. Therefore it was decided that all transfusions would be done by one of us (M. H. B.), who is not a member of the operating team and who, as a clinical pathologist, has had considerable experience in venipuncture, for the proper placing of the needles in the veins is probably the most important technical step of the transfusion, and who devised the transfusion apparatus shown in Fig. 1. By this method it is possible to transfuse a large quantity of blood, 1 c.c. at a time, so that there is a minimum of exposure of the blood to conditions outside of the vessels and clotting changes are slow to occur, and chemicals are not used. This principle of transfusing a small quantity

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of blood with each turn of the wheel eliminates many of the difficulties of transfusion as there is no delay, for the smallest blood supply in the venous lake of the arm will readily supply 1 c.c. at a time, and the use of small needles is possible so that dissection of the veins is very seldom necessary.

Many transfusions of 300 to 600 c.c. are reported in the literature. The purpose of this paper is to report our experience with large transfusions instead of multiple small ones. We have arbitrarily designated a massive transfusion as one that consists of more than 600 c.c. of blood,

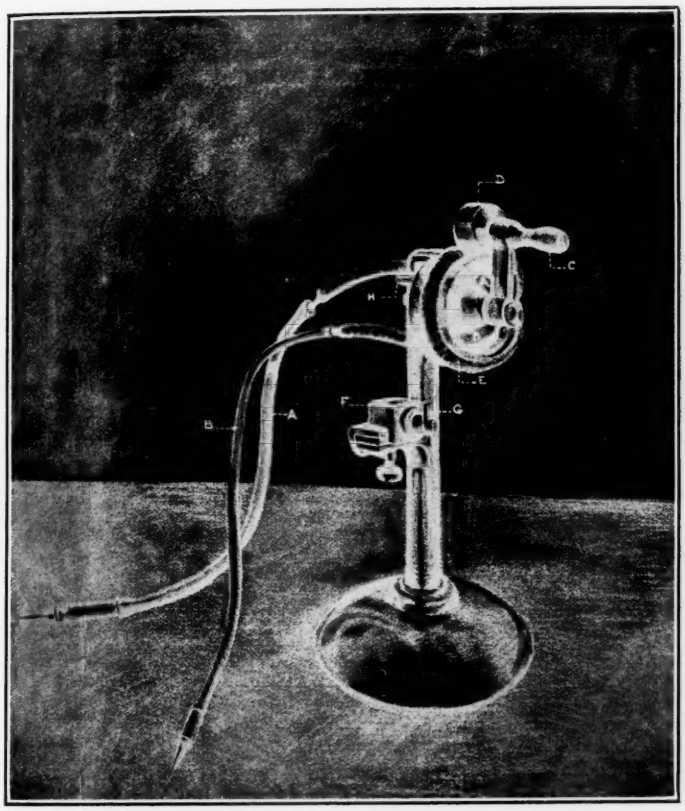

Fig. 1.—The Baker transfusion apparatus. Blood is drawn from donor's vein through a 16 to 18 gauge needle into thin-walled tube *B*, to compression tube *E* by milking action of roller *D* traveling over the compression tube pushed by handle *C*. The blood is in like manner expelled from the compression tube through delivery tube *A* through 18 to 20 gauge needle into the patient's vein. Each revolution delivers 1 c.c. of blood. The roller *D* trips lever *G* and records the revolution on counter *F*. The cam *H* is arranged to close the lumen of the compression tube to prevent back flow of blood while the roller passes the gap in the compression tube circuit.

and for these massive transfusions two or more donors are used. The reasons for using single large transfusions have been, first, that a single small transfusion is insufficient in certain cases, and second, when bloods are well matched, there is less danger of serious reaction in a single large transfusion than in repeated transfusions. In the literature attention

has been called frequently to the increased danger of serious reaction after each successive transfusion. Multiple transfusions have not been discarded entirely, as will be brought out later in the paper, but they are used much less frequently than in our earlier experience.

This series consists of our last 246 transfusions which were done in 202 patients; 167 of the patients had single transfusions and 35 had multiple transfusions. The low incidence of multiple transfusions is because they were all surgical patients, that very few were transfused for prolonged infection, and chiefly because we prefer large single transfusions when possible. Most of them were transfused in preparation for operation, or during operation, as will be described later.

Of the 246 transfusions, 113 were of 600 c.c. or less and 133 were of more than 600 c.c.; 111 of these were single transfusions of 1,000 c.c. or more as follows: 38, 1,000 c.c.; 15, 1,100 c.c.; 50, 1,200 c.c.; 2, 1,300 c.c.; 4, 1,400 c.c.; and 2, 1,800 c.c.

In these 246 transfusions it was not necessary to cut down on the vein of a single donor and in only 4 instances was this necessary in the recipient. This is a tribute to the method, when one considers the large volumes of blood transfused, and that most of the patients were women, many of whom were adipose or whose veins were small normally, or in some cases were collapsed from acute anemia or shock. Seven hundred cubic centimeters was the largest amount of blood taken from a single donor, and this was done only in a few cases. In all other transfusions of more than 600 c.c. two donors were used. The only exception to this was that on two occasions, transfusion of 1,800 c.c. was made and three donors were used.

The indications for transfusion before, during, or after operation have been briefly as follows:

1. *Acute secondary anemia or shock from loss of blood as in ruptured ectopic pregnancy, hemorrhage from duodenal or gastric ulcer, etc.* In these patients, the critical condition is due to excessive loss of blood, and the urgent need of the patient is blood and not in small doses, in order to save life immediately or to make operation feasible as soon as possible. The classical type of ruptured tubal pregnancy, in which the abdomen is full of blood and there is marked pallor, weak pulse, and the typical signs and symptoms of hemorrhage, is the type of case in which massive transfusion is particularly indicated. It is our impression that it is the second 500 to 600 c.c. of the transfusion that is responsible for the most clinical improvement. The transfusion should be started at the time the incision is made. It does not seem logical, when the patient has bled from 1 to 2 liters of blood into the abdomen, that she should be given a transfusion of only 400 to 500 c.c.

2. *Chronic secondary anemia from repeated loss of blood, as in menorrhagia, metrorrhagia, bleeding hemorrhoids, etc.* When the time of operation is elective, as in fibroid tumors, and the patient shows marked anemia of long duration with hemoglobin below 50 per cent, the procedure is to give a large transfusion of 1,000 to 1,200 c.c. and then if the patient's condition warrants, the operation is done before the next expected menstrual period, thereby giving her the benefit of

an increased blood volume and hemoglobin content over a period of time before operation. If the tumor is adherent or a difficult operation is expected, another transfusion is done during the operation.

If the anemia is moderate, 50 to 70 per cent hemoglobin, the transfusion is done only at the time of operation, and a large transfusion of 1,000 to 1,200 c.c. is given.

3. *In the treatment of shock or the anticipation of shock.* It is this group in which we are particularly interested. Blaloch[1] has found that in prolonged low blood pressure from shock there occurs a capillary congestion of organs and increased permeability of capillaries with hemorrhage and loss of fluid into the tissues. Blood transfusion may be of no benefit then. It is too late. On the other hand, if bleeding from a large vessel is stopped, blood introduced into the vascular system will remain, but not so after it is being lost from numerous small vessels as a result of prolonged shock. We feel that the best time for transfusion for shock is as soon after its appearance as possible, or preferably before the shock occurs, and it is here that anticipation is particularly valuable. Regardless of the presence or absence of anemia, there are many patients in whom the general condition is not good, but is as good as we are able to obtain, the so-called poor operative risk. There are many patients whose general condition is good or fair, but on whom we expect to do an operation, difficult for surgeon and patient, in which there will be considerable trauma and loss of blood, as when there are many adhesions, or large fixed tumors or in extensive resections of malignant growths. It is in such conditions that it is well to be prepared and to give a transfusion during the operation. Transfusion is very valuable in maintaining blood volume and in supporting the circulation during severe operations. In the course of such an operation when pulse volume is decreasing and pulse rate is increasing, there is a very striking improvement in volume of pulse, a definite slowing of the pulse rate and a rise in blood pressure after massive blood transfusion. It is of great value to the surgeon to have a transfusion started when he is in the midst of a difficult operation and the anesthetist warns that the patient's pulse is getting weaker, and the surgeon is not in a position to discontinue the operation; or to have the patient leave the operating room, after a severe operation, with as much or more blood than when she arrived. These patients stand large transfusions well, when there has been loss of fluid or blood from the circulation. To replace the fluid volume with saline or glucose solution is very temporary as it soon leaves the circulatory system, but transfused blood if given in due time, remains in circulation and is superior to any other substitute. A patient leaving the operating room with a good circulation and with more blood than when she arrived, is better able to resist or cope with postoperative complications than one who leaves the operating room in a state of exhaustion or shock.

Dr. James S. Taylor, Chairman of the Committee on Maternal Welfare in Pennsylvania, has furnished me with some interesting data on the mortality in ectopic gestation collected in the New York Survey, the Philadelphia Survey, and the Fifteen States Survey. The Committees attribute the lack of appreciation of the necessity for blood transfusion as one of the factors responsible for this mortality.

SERIES DURING OPERATION

One hundred and twenty-one of the transfusions were done during operation. The usual procedure in an elective abdominal operation, when it is thought that a transfusion will be of benefit, is to have the bloods of the patient and the prospective donors typed and cross-matched in advance, and Kahn tests made. The suitable donors report at the

scheduled time for operation. The donors are usually secured from among relatives or friends or from the students of the University of Pittsburgh who have been typed and listed and are available at any time.

If it is a combined vaginal and abdominal operation, the vaginal work is completed and the field of operation on the abdomen prepared, and when the incision is being made, the transfusion preparations are carried out and transfusion started. In this way there is no interference with the operating team.

REACTIONS

In not a single instance has a chill occurred when transfusion was done during operation. If chills and temperature reactions are due to anaphylactic reactions, there is experimental evidence to account for our failure to have chills in patients transfused when under anesthesia, for it has been found by others[2] that acute anaphylactic shock does not usually occur in animals previously sensitized to foreign proteins, if the second dose of protein is given when the animals are anesthetized. Bronfonbrenner[2] found that certain anesthetics increase the antitryptic action of the blood, and he suggests that in sensitized animals the anesthetic may thus reduce temporarily the activity of the proteolytic enzyme and so slow the rate of splitting of the injected protein that acute symptoms of anaphylactic shock are averted. This experimental evidence, along with our clinical experience, would seem to indicate that the safest time to do transfusion is when the patient is under anesthesia. Of course this would not apply to hemolytic shock when bloods are wrongly matched.

In the 125 transfusions that were done when the patients were not under anesthesia, there were 8 chills or an incidence of 6.4 per cent. Of those who did not develop chills 14 per cent had a temperature reaction above 101.5° in the first seventy-two hours. These reactions are less frequent since using specially prepared salt solution for filling the transfusion apparatus before and after transferring the blood.

In the 121 transfusions done during operations a temperature rise above 101.5° in the first seventy-two hours occurred in 21 per cent. We believe that, considering the type of patient and operation in which transfusion was used, this is not more than one would expect from operation alone.

There have been no cases of hemolytic shock. We attempt to avoid serious reactions by practically never using universal donors. The donor and recipient must be in the same group, and with satisfactory cross-matching. If repeated transfusions are done, the cross-matching is repeated before each transfusion. Many of the serious reactions reported in the literature were thought to be due to the use of universal or Group IV donors, although Brines[3] in a report of 4,000 cases advocates the use of universal donor. The donors are instructed to take no food

for twelve hours beforehand. The transfusions are carried out by one individual (M. H. B.), who personally cares for the apparatus and needles. A minimum of delay in transferring the unmodified blood is very important in avoiding reactions. The occurrence of chill or temperature reaction does not seem to depend on the quantity of blood given. This, of course, would not be true of incompatible bloods. In our series there were very few patients transfused for infection, so because of our limited experience, we do not advocate massive transfusions in this type of case.

There was an average increase of 10 to 15 per cent in the hemoglobin after transfusion of 500 to 600 c.c., and 20 to 30 per cent in transfusion of 1,000 to 1,200 c.c. In a patient with hemoglobin of 30 per cent, for instance, one can usually expect an immediate increase of hemoglobin to 50 or 60 per cent after a transfusion of 1,000 to 1,200 c.c.

Table I indicates some of the more common conditions in which transfusion was used before or during operation.

TABLE I

1. *Acute Anemia*	
Ruptured ectopic pregnancy	12
Abortion	11
Hydatidiform mole	1
Banti's disease	2
2. *Chronic Anemia From Menorrhagia or Metrorrhagia*	
Fibroids	45
Pelvic inflammatory disease	24
3. *Malignant Disease* (Transfused because of anemia or poor general condition)	
Carcinoma of cervix uteri	9
Carcinoma of fundus uteri	4
Carcinoma of ovary	10
Sarcoma of uterus	1
Carcinoma of stomach	7
Carcinoma of colon	5
Carcinoma of liver	1
Carcinoma of pancreas	2
Carcinoma of kidney	1
Hypernephroma of kidney	1
Carcinoma of bladder	1
Carcinoma of breast	4
4. *Poor Operative Risks*	
Pelvic inflammatory disease	21
Fibroids	7
Biliary tract disease	19
Peptic ulcer	3

Whether transfusion is done in a given patient depends on the degree of anemia, the general condition of the patient, and the nature and extent of the operation.

It is by no means a panacea as is evident from the mortality in this series, but it is one of the safeguards that we can use in a patient who is not well equipped to withstand the contemplated operative procedure.

MORTALITY

Of the 121 patients transfused during operation there were 17 deaths. While this is a high mortality, it must be remembered that this series includes our worst cases, the aged, the obese, and those with prolonged jaundice. Eleven of 17 who died had malignant disease. Seven of these deaths occurred from one week to two and one-half months after operation, and death could not in any way be attributed to transfusion. Ten patients died within the first week after operation as is shown in the case reports. In none of these do we feel that transfusion was responsible, for they were all very ill patients in whom death was a very likely outcome following operation. In the jaundiced patients who died within twenty-four hours, there may be some justifiable doubt as to whether transfusion was responsible. There was no evidence of hemolysis or urinary suppression in any of these cases, however.

We have no apology to make for the risks that were assumed in this series. In the 11 patients with malignant disease and in 2 patients with prolonged jaundice without malignant disease, death was certain without operation. Among the patients who recovered were some in whom the risks seemed just as great, but who were salvaged by operation, for example, as in the following case:

A thin, pale, undernourished woman, aged forty-three years and weighing 90 pounds, was admitted, complaining of enlargement of the abdomen and loss of weight. Examination revealed a fixed mass filling the pelvis up to the umbilicus. The appearance of the patient, the rapid growth and the fixation of the mass made us feel that she had a malignant cyst of the ovary. An attempt at removal was advised. The mass was found to be a solid tumor of the ovary, adherent by recent inflammatory adhesions with no evidence of gross extension of the tumor. Separation of the adhesions was accompanied by profuse bleeding so that before transfusion was started, the pulse was becoming more rapid and weak. One thousand two hundred cubic centimeters of blood were given with marked improvement in pulse rate and volume. The tumor was removed, and the patient left the table in a satisfactory condition. Exploration of the upper abdomen revealed a large, freely movable carcinoma in the hepatic flexure of the colon. No metastases were felt in the liver. There had been no symptoms of obstruction, and aside from slight cramps and some looseness of the bowels, there were no symptoms of involvement of intestine. The patient made a good recovery, and three weeks later the right half of the colon was resected and ileocolostomy was done. Again the patient was given 1,200 c.c. of blood during operation. Three days after this operation, the hemoglobin was 82 per cent as compared with hemoglobin of 60 per cent on admission. Three weeks after the second operation, patient was walking about and was allowed to go home.

Our impression was that we had to deal with a primary carcinoma of the hepatic flexure with secondary growth in the ovary much larger than the primary growth. It was thought that this would prove to be a Krukenberg tumor, but the sections do not show the typical characteristics of a Krukenberg tumor and the histologic pictures of the two tumors are so different that our pathologist, Dr. Bruecken, feels that they may be independent primary growths. The growth in the colon is a colloid adenocarcinoma, while that in the ovary is a solid tumor with no glandular arrangement and no manifestation of colloid or mucous secretion or formation.

No evidence of metastases to glands, liver, or peritoneum was found. X-ray examination of the colon with barium before the second operation, and examination of the specimen removed revealed almost complete occlusion of the lumen of the colon, although the patient had no symptoms of obstruction. Massive blood transfusions in this seriously handicapped patient helped to carry her through two severe operations with an increase of 22 per cent hemoglobin in spite of profuse bleeding in the first operation.

A study of the following case reports will reveal that by careful preoperative preparation and by transfusions at the time of operation our efforts were toward salvaging what we could rather than denying patients surgical treatment because of the hazards involved.

CASE REPORTS

MORTALITY BEFORE ONE WEEK AFTER OPERATION

CASE 1.—Patient, aged fifty-five years, had Banti's disease, cirrhosis of liver, diabetes, and chronic nephritis. Operation: Splenectomy. Transfusion during operation, 1,200 c.c. Patient had repeated hemorrhages from the stomach before operation, and several transfusions were done for anemia. Following operation there was distention and vomiting, but this was relieved by in-lying nasal tube. Coma developed five days after operation, with death on the sixth day. Impression was that patient died of hepatic and renal insufficiency.

CASE 2.—Patient, aged sixty-four years, had chronic cholecystitis, cholelithiasis, choledocholithiasis with jaundice, chronic myocarditis, intestinal and omental adhesions. Operations: Separation and division of adhesions, cholecystectomy, and choledochostomy. Transfusion, 500 c.c. Patient was a poor operative risk from the standpoint of her circulatory system. She had preoperative preparation with glucose solution. The operation was difficult and the patient's condition was unsatisfactory from the time of operation until death twenty-four hours later. Pulse was weak and irregular throughout.

CASE 3.—Patient, aged sixty years, had carcinoma of ascending colon and intestinal obstruction. Operation: Ileostomy. Transfusion, 1,000 c.c. Patient was stout and anemic. Abdomen was distended and peristaltic waves were visible. She had been vomiting off and on for a month and several days were used to prepare her for operation. The mass in the ascending colon was so adherent that cecum could not be delivered. Small intestines were greatly dilated. Ileostomy was done in lower ileum. After operation, abdomen remained moderately distended and enterostomy did not drain well, and the temperature and pulse remained elevated. There was profuse drainage of dark green fluid from nasal tube in stomach. Patient died six days after operation, apparently from peritonitis. No autopsy was permitted.

CASE 4.—Patient, aged twenty-seven years, had carcinoma of sigmoid with metastases to both ovaries and the peritoneum. Operation: Bilateral oophorectomy and Mikulicz operation (first stage) for tumor in sigmoid. Transfusion during operation, 1,000 c.c. Aside from dragging sensation with pressure of mass in lower abdomen, there were no symptoms of the extensive malignant condition found at operation. The ovaries were the size of grapefruit and were not adherent. Nodules were present on the surface. Nodules were present in the omentum adherent to the growth in the colon. Patient died three days after operation from peritonitis and septicemia. (*Streptococcus hemolyticus* was recovered from heart's blood at autopsy.)

CASE 5.—Patient, aged twenty-four years, had occlusion of common duct due to injury at operation and was pregnant (two and one-half months). Operation: Anastomosis of bile sac to stomach. Transfusion, 1,200 c.c. Patient was jaundiced since the day after a cholecystectomy ten months beforehand. She was vomiting for four days before admission. Coagulation and bleeding time were prolonged, and the stools contained no bile. Calcium was given intravenously for three days before operation, and patient had the usual preoperative preparation with glucose solution. A large walled-off collection of bile was found in the usual location of the common duct and was evidently the result of complete severance of the duct at operation, and later absorption of the ligature. Ends of the duct were not found. An effort was made to connect the bile cavity and stomach by means of a T-tube. Patient aborted twelve hours after operation and died five hours later. No evidence of hemorrhage.

CASE 6.—Patient, aged seventy-four years, had carcinoma of the hepatic flexure of colon, intermittent attacks of intestinal obstruction, and chronic bronchitis. Operation: Resection of terminal ileum, ascending colon, and one-half of transverse colon, ileocolostomy, Mikulicz. Transfusion during operation, 1,200 c.c. Patient died of pneumonia six days after operation. No evidence of peritonitis.

CASE 7.—Patient, aged thirty-nine years, had metastatic carcinoma of liver and periductal lymph nodes with obstruction of common duct and marked distention of gallbladder. Operation: Cholecystogastrostomy. Transfusion, 1,200 c.c. Radical amputation of breast for carcinoma four years before. Five weeks before admission patient had pain in epigastrium and back, and two weeks later she noticed the presence of jaundice. Exploratory laparotomy was advised. Coagulation time and bleeding time were prolonged, and calcium was given intravenously for three days before operation, and glucose was administered. Patient died twenty-four hours after operation. Autopsy revealed carcinoma in liver, lymph nodes, along common duct, and in the ovaries. No hemorrhage.

CASE 8.—Patient, aged thirty-five years, had chronic metritis and chronic salpingitis. Operation: Bilateral salpingectomy and supravaginal hysterectomy. Cervix had been cauterized at a previous operation. Transfusion, 1,200 c.c. Patient was obese, dyspneic, and had excessive menstrual flow. Hemoglobin, 55 per cent. She was kept in bed for two months before operation. Pulse remained rapid throughout postoperative period, and patient died seven days after operation of circulatory failure. No evidence of peritonitis.

CASE 9.—Patient, aged twenty-five years, had puerperal infection and suppurative thrombophlebitis of left ovarian vein, and inferior vena cava. Operation: Exploratory laparotomy. Transfusion during operation, 250 c.c. Patient was delivered of one of twins at home. Was sent to hospital fourteen hours later for delivery of the other of the twins. She developed puerperal infection with chills and fluctuations of temperature from normal to 106°, as is seen in thrombophlebitis. This continued for one month with no evidence of improvement in spite of blood transfusions, etc. She then developed an enlarged very tender liver with right diaphragm pushed high. With the idea that patient probably had a liver abscess, exploration was done. Patient was pale and thin, with hemoglobin of 50 per cent. Liver was much enlarged but no abscess found. Left ovarian vein was thrombosed up to the renal vein. During this exploration and while the patient was being transfused, she died suddenly. Autopsy revealed suppurative thrombophlebitis of left ovarian vein, left renal vein and inferior vena cava to above the diaphragm. A large pulmonary embolus was the cause of death. Embolic abscesses were found in lungs and spleen. The very tender greatly enlarged liver led us to believe that drainage of an abscess might change the course of this illness, but autopsy revealed a hopeless condition.

CASE 10.—Patient, aged fifty-five years, had a carcinoma of head of pancreas. Operation: Cholecystogastrostomy. Transfusion during operation, 500 c.c. Patient had complete biliary obstruction for ten weeks before admission. Marked purpura was scattered over the body, and melena were present. Coagulation time ten minutes. Bleeding occurred intermittently all day from puncture wound to determine bleeding time. Patient was given calcium, glucose, and 500 c.c. of whole blood daily for three days before operation. This reduced coagulation time to two and one-half minutes and bleeding time to three minutes. Operation was done entirely with local anesthesia, and patient left operating room in good condition. Following operation, temperature rose steadily to 107° before death thirty-six hours later. There was also increasing mental dullness which went on to stupor and coma. Incision was reopened after death and no evidence of hemorrhage or peritonitis was found. Death was attributed to liver insufficiency. Carcinoma of head of pancreas and suppurative cholangitis were found to be present on microscopic examination.

MORTALITY LATER THAN ONE WEEK AFTER OPERATION

CASE 1.—Patient, aged sixty years, had chronic cholecystitis, cholelithiasis, carcinoma of head of pancreas, and jaundice. Operation: Cholecystostomy (removal of stones), choledochostomy, and biopsy. Transfusion during operation, 500 c.c. Jaundice for five weeks before operation. Preoperative preparation with glucose. Patient died eight days after operation. Pathologic diagnosis: Adenocarcinoma of pancreas.

CASE 2.—Patient, aged seventy years, had carcinoma of pylorus. Operation: Subtotal gastrectomy and gastrojejunostomy (Polya). Transfusion, 500 c.c. Patient had normal temperature and pulse for ten days before her sudden death while sitting up in bed talking to friends thirteen days after operation.

CASE 3.—Patient, aged sixty-nine years, had duodenal obstruction and cicatrizing duodenal ulcer. Operation: Gastroenterostomy. Transfusion, 500 c.c. Patient had been vomiting everything for three weeks before operation. X-ray examination revealed retention of 90 per cent of barium in stomach at six hours. Patient died of pneumonia thirteen days after operation.

CASE 4.—Patient, aged fifty-four years, had carcinoma of ascending colon. Operation: Resection of terminal ileum, ascending colon and a portion of transverse colon, and ileocolostomy (Mikulicz). Transfusion, 600 c.c. Patient had always been very thin and had lost weight before operation. Death occurred sixteen days after operation from malnutrition and infection of wound around intestinal fistula.

CASE 5.—Patient, aged fifty years, had a general carcinomatosis of abdomen. Operation: Exploratory laparotomy. Transfusion, 1,000 c.c. Patient had radical operation for carcinoma of breast twenty months beforehand. She was admitted with vomiting and ascites. At operation, general carcinomatosis was found. Patient continued to vomit and died seventeen days after operation.

CASE 6.—Patient, aged forty-two years, had a sarcoma of the uterus. Operation: Laparotomy, dilatation of cervix and insertion of radium. Transfusion during operation, 600 c.c. Patient had menorrhagia and metrorrhagia for four months before admission. She was running a septic temperature on admission. History of having passed a fleshy mass two weeks beforehand. There was a hard, irregular, movable mass filling the pelvis to above the umbilicus. Hemoglobin, 32 per cent. Aschheim-Zondek test was negative. One month after admission patient extruded a large, sloughing, pedunculated mass from the uterus. This was removed and pathologic diagnosis was leiomyosarcoma. Blood transfusion of 500 c.c. was

given. Following this the temperature gradually came to normal so that one month later, laparotomy was done and the large uterus was found to be free except on left side where there was direct extension of the growth through broad ligament to abdominal wall and was found to be inoperable. Cervix was dilated and radium was inserted into uterine cavity. Bleeding stopped, but patient died two and one-half months after operation. No autopsy was permitted.

CASE 7.—Patient, aged fifty-nine years, had a carcinoma of the breast. Operation: Radical operation for carcinoma of breast. Transfusion, 1,200 c.c. Patient was a large, very stout woman. She made a good postoperative recovery, with normal temperature after the first two days. Seven days after operation, she had successive attacks of sharp pain in the left chest, in the left upper abdomen in the region of the spleen, and in the left calf of the leg, evidently due to emboli. She was then as well as usual for twenty-four hours when there was sudden severe pain in the precordium with collapse and death in one hour, apparently from a coronary embolus.

CONCLUSIONS

From our clinical experience, the following impressions have been gained:

1. Massive blood transfusion is a most valuable treatment of acute hemorrhage or early shock.

2. Blood transfusion during operation is one of the best measures for preventing exhaustion or shock.

3. Patients with hemoglobin of 70 per cent or less are handicapped patients and it is questionable whether we are justified in subjecting them to elective severe surgical procedures without transfusions.

4. Blood transfusion is a measure that aids in making poor operative risks safely operable.

5. With compatible bloods, a large transfusion is probably as safe as a small one, and safer than multiple small transfusions. Perhaps this may not be true in the presence of severe infections.

6. For the prevention of unfavorable reactions, it is an advantage to have transfusions done by one individual equipped with a method for the uniformly successful transfusion of large quantities of blood without cutting down on the veins, without the use of chemicals, and with a minimum of exposure of the blood to conditions outside of the vessels. In order that transfusions may be done during the operation, this individual should not be a member of the operating team.

7. Although multiple donors are used, unfavorable reactions are rare if the following precautions are carried out: (a) The use of donors of the same group as the recipient whose bloods have been directly cross-matched with that of the recipient. (b) The donors should not take food for 12 hours before a scheduled transfusion. (c) That there be no technical errors or delays in the transference of the blood.

8. Transfusions with the recipient under anesthesia seem to eliminate chills and lessen the incidence of temperature reactions.

REFERENCES

(1) *Blaloch, Alfred:* Arch. Surg. **29:** 837, 1934. (2) *Bronfenbrenner et al.:* J. A. M. A. **99:** 1194, 1932. (3) *Brines, O. A.:* J. A. M. A. **94:** 1114, 1930.

DISCUSSION

DR. DAVID N. BARROWS, NEW YORK, N. Y.—On the gynecologic service of Bellevue Hospit ' from January, 1931, to September, 1935, a total of 412 patients received 716 transfusions. There were no deaths in any way attributable to the transfusions. Three patients had severe reactions, two with anuria for twelve hours, then jaundice and hematuria; the third with oliguria and jaundice. Two hundred and five patients were transfused for hemorrhage, sudden or prolonged, such as with abortions, ectopic pregnancy, or fibroids; 176 patients were transfused for septic and inflammatory conditions; 30 patients for anemia associated with malignant growths, mainly carcinoma of the uterus.

The 205 patients transfused for loss of blood received 263 transfusions. The large majority, 152, received 500 c.c., while 17 received 600 c.c. or over. When the first transfusion proved insufficient, it was repeated once in 39 cases, twice in 10, and 4 times in 2 cases. In these hemorrhage cases there were 13 slight reactions with temperature up to 101.6°, 8 moderately severe with temperature up to 103°, and 1 quite severe with temperature to 105°, but no other alarming symptoms. Eight of these patients died; none, however, from transfusion.

In the septic group, 176 patients received 414 transfusions, the average being, therefore, 2.4 each. Fifteen patients received 5 transfusions; two, 7 transfusions; one, 9 transfusions; and one, 13 transfusions.

With repeated transfusions we use as a rule 250 to 500 c.c. at a time. Of this group 9 had mild reactions, and 2 severe with anuria, hematuria, and jaundice. Forty-six patients died, but none from transfusion.

There were 30 cases of malignancy and disease, receiving 39 transfusions, with 3 moderate and 1 fairly severe reaction.

Take a patient whose blood value is already low, deplete it further by hemorrhage or operative loss, and a few hours of the resulting anemia before transfusion is performed can produce tissue cell changes from which the patient will not recover. This fact explains the reason why patients with placenta previa, ectopic gestation, etc., will die following a comparatively slight blood loss during treatment after withstanding a number of quite severe hemorrhages. This has been well worked out by Roome, Keith and Phemister and must be kept in mind when planning any operative procedure on an anemic subject.

As to the dangers of transfusion, of which few of us think at the time of need, Brines' report of only two to four fatalities in 4,000 attributable to the transfusion alone, is encouraging. David Bull says that the use of whole blood as compared with citrated blood has reduced the reactions of moderate degree from 5 or 3 to 1.

Mention is made of donors by Cashman, fasting twelve hours, presumably to avoid allergic reaction due to diet of donor, which is a good point. Cross-matching may not be necessary in well-grouped cases, but it eliminates the chance of error in a busy clinic.

Availability of donors is a sore point with us at Bellevue. The average size of our transfusions for hemorrhage has unquestionably been reduced by the unwillingness of city paid donors to give more than as little blood as possible, and never over 600 c.c. Typing the medical students, as done at the University of Pittsburgh, makes a large group available and seems an improvement over routinely typing all postoperative and other suitable cases in the ward and using them in an emergency as reported by Wangenstein. Many clinics routinely employ 800 to 1,000

c.c., including The Presbyterian Medical Center, Charity Hospital in New Orleans, and others as indicated by informal reports. For chronic sepsis, slow convalescence from infection, long postoperative courses, and similar depletions of blood quality, we have found the small, repeated, so-called medical transfusion very useful.

DR. JAMES E. SADLIER, POUGHKEEPSIE, N. Y.—As the technic of blood transfusion has become simpler and simpler, some of us starting with 500 c.c. at each transfusion have gradually increased the amount, but I have never used the massive amounts indicated by the essayist. About 600 or 700 c.c., perhaps a little more, has been relatively frequent in my practice, and I have not noticed that there was any greater reaction in those cases having the larger transfusions than in those with the smaller ones.

I am in accord with Dr. Cashman as to the danger of multiple small transfusions, except where this has to be used in children, and I feel that if we are going to use this excellent therapeutic measure we should certainly use an amount sufficient to do some good. I am not in accord, however, in respect to the universal donor. I have frequently used the universal donor and do not recall that we have had any greater number of reactions. Perhaps I have not watched that closely enough.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—Dr. Cashman brought out one important point I should like to speak of. Some years ago we did have frequent chill reactions following transfusion, and it occurred to me that perhaps we were using the donors too soon after they had eaten. With Dr. Parker, my assistant who gives most of the transfusions, we decided to have these patients go without food for at least six hours. We thought that perhaps the blood saturated with the proteins of the meal might be giving the reaction. I have not seen that mentioned in the literature. Since then our patients have been practically free from reactions despite the fact that we use the citrate method.

I feel that Dr. Cashman has given us something of great value, to realize that a patient will take that much blood, and surely the blood does stay in the vessels. Any solution is rapidly eliminated from the vascular system, but the blood remains there.

DR. CASHMAN (closing).—There have been objections to the universal donors and we do not use them for we have tried to use all the precautions possible, particularly in these massive transfusions. The same is true with regard to food. Whether it plays a part in the reactions we do not know, but it may do so. The reason that we specify twelve hours is that we operate in the morning and have the donors take no breakfast.

Referring to Dr. Gordon's paper yesterday on ectopic gestation, Dr. Calkins said that often if a surgeon gives a transfusion he thinks that he has done his part, whereas he should continue giving transfusions until the patient is in good condition. This morning in discussing premature separation of the placenta, Dr. Bill warned against waiting until after delivery to give the transfusion. He advocated giving it before or during delivery, and that is our opinion exactly. In addition, we are advocating in elective surgery transfusion on the operating table for patients who are handicapped and on whom we are anticipating a severe operation with, perhaps, much loss of blood.

FIBROSIS OF THE PLACENTA*

Its Significance in the Normal and in the Syphilitic Organ

Thaddeus L. Montgomery, M.D., Philadelphia, Pa.

(From the Department of Obstetrics, Jefferson Medical College Hospital)

THREE circumstances have led me to undertake a study of fibrosis of the human placenta: first, a paper on the subject "Fetal Death in Pregnancy"[14] presented by J. Stuart Lawrence before the Philadelphia Obstetrical Society in October, 1932; second, the looseness with which the term "fibrosis" is applied to the gross appearance of certain indurated lesions of the placenta; and third, the questionable authenticity of descriptions of the syphilitic placenta which appear in textbooks of obstetrics.

As to the first of these, I was keenly interested in Dr. Lawrence's observations. He had followed closely the character and rapidity of the fetal heart rate in a group of prenatal patients with the purpose of detecting the first signs of inanition of the fetus and forestalling the occurrence of intrauterine fetal death. Increase in rapidity of the heart rate and unusual activity of the fetus were taken as evidences of fetal embarrassment, and the intravenous injection of concentrated solutions of dextrose into the mother was the method used in the relief. Dr. Lawrence attributed the symptoms of inanition of the fetus to disturbances in the permeability of the placenta and stated that in the majority of the cases fibrosis of the placenta was found upon histologic study of the secundines after delivery.

In the discussion of his paper I stated that while it is possible for large portions of the placenta to be thrown out of function by necrosis of villi and by intervillous thrombosis and thus cause fetal death, I had never seen fibrosis of the placenta of a grade sufficient in my opinion to produce this outcome. I went on to say that while I, too, had been guilty of using the term rather freely, I was beginning to doubt the existence of fibrosis of the placenta as a pathologic entity, and though at the time I had insufficient data at hand to support this opinion, I was resolved to go into the subject more thoroughly at some future date.

With this thought in mind I have reviewed my placental sections, studied the histories of the corresponding patients, and endeavored to determine: first, what effect the so-called lesion of fibrosis has upon

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the weight of the newborn; second, what effect it has upon the occurrence of stillbirth; and third, what conditions gave rise to a diagnosis of fibrosis if such is not a pathologic entity.

Among the record of 700 placentas which were examined grossly and microscopically, I found 101 in which mention was made of increase in density of the connective tissue of the villous stroma, and 54 in which the deposit of fibrous tissue around the fetal vessels of the placenta appeared heavier than normal. To these respective appearances the terms "diffuse fibrosis of the placental villi" and "perivascular fibrosis" were applied. In many instances the two types of "lesion" were found coexistent in the same placenta.

In the 101 instances of "diffuse fibrosis" there were, of infants born at or near full term, 86 reported weights, of which the average was precisely 7 pounds. In the 54 instances of perivascular fibrosis, there were 48 reported weights of infants born at or near full term; the average of these was 7 pounds 2 ounces. These average weights are well within normal for ward charity patients, 50 per cent of whom are colored.

In the first group of 101 patients there were 5 stillbirths: 2 due to toxemia; 1, to syphilis; 1, to embryotomy; and 1, to monstrosity. In the second group of 54 patients there were 6 stillbirths: 3 the result of syphilis; 2, of toxemia; and 1, of embryotomy.

I approach the problem of why the diagnosis of fibrosis was made originally in these numerous instances with considerable temerity, for when one goes back in the light of new-formed opinion to rescind or correct a previously formed judgment, he is in almost as great danger of undertaking his task in a prejudiced manner as he was of committing error in the original work. Nevertheless, as the conclusion of increasing experience, I am certain that there were certain pitfalls into which I fell, and into which others may also. Perhaps anxiety to detect too minute lesions in the organ that one is studying and too great willingness to accept the interpretations which have been handed down through generations of textbooks, account for some of the error. Whatever may have been the reason, a review of this entire problem convinces me that within the normal life span of the placenta, true fibrotic lesions do not develop.

That the amount of connective tissue varies between different specimens and between different histologic sections is apparently true. Several conditions account for such variation. In the first place, between different subjects, the histologic architecture of the full-term placenta differs with some degree of latitude, one specimen revealing upon microscopic study a delicately constructed system of villi and capillaries, another a more rugged stroma, while both are adequate for the needs of the fetus in utero. Then again the histologic archi-

tecture of the villi appears different within various portions of the same organ, depending upon the site from which the sections are cut. Particularly as the periphery of the placenta is approached, the walls of the fetal vessels appear thickened, their lumen obliterated in many places, the villous stroma filled with more dense connective tissue, and the caliber of the capillaries reduced (Fig. 12).

There is another phenomenon I have noted, which Runge and Hartman[12] mention in a recent publication; that is, that when the vascular tree of the placenta is collapsed and the lumen of the vessels and capillaries is devoid of blood, the amount of fibrous tissue in the vessel wall and the villous stroma appears grossly exaggerated (Fig. 10). The latter condition is particularly likely to hold when the cord has not been ligated until the pulsation of the funic vessels has ceased, and the placental reservoir of blood has been taken into the fetal circulation, or when the cord has been cut and the blood allowed to drain from the placenta before it is delivered. Surprising differences in the microscopic appearance of the placenta depend upon these several methods of management.

Another factor which influences tremendously the appearance of density of the villous stroma is the degree of maturity of the placenta. The stroma of the placental villus is more richly endowed with connective tissue elements at the twenty-fourth week of pregnancy (Fig. 4) than at complete term (Fig. 9), a phase of the subject I wish to deal with more extensively in connection with the syphilitic patient. Therefore, a placenta slightly immature may lead the uninitiated to believe he is dealing with a beginning fibrosis.

Possibly the greatest error is that committed upon gross examination, of calling gray indurated zones of the placenta "fibrotic lesions." Upon microscopic examination of these "fibrotic lesions" one of two conditions is inevitably found: either a mass of necrotic villi matted together by fibrin deposit, or an old hematoma in which the red blood cells have undergone autolysis. I have dealt with both of these lesions in another paper.[8] In neither of them is fibrous tissue organization present; in fact in none of them have I ever seen a process of organization beginning. There is only one indurated gross lesion of the placenta in which excess of fibrous tissue is found; that one is a neoplasm and decidedly rare, fibroangioma.

One cannot leave the subject of fibrosis of the placenta without considering its relationship to syphilis. In so doing we undertake a controversial topic. For many years we have been taught that the placenta of the syphilitic fetus has certain unmistakable characteristics, that it is a large organ in ratio to the size of the child, that it has a pale greasy surface, that when teased out under salt solution the villi appear club-shaped and blunt, that the microscopic examina-

tion reveals a diffuse fibrosis of the villi, a diminution of the capillary bed, and perivascular thickening of the vessels, that silver staining reveals the presence of spirochetes. It has been affirmed that a diagnosis of syphilis can be made upon the basis of these several criteria.

From time to time a question has been raised as to the infallibility of these criteria. In one of his recent publications McCord[7] presents the following observation: "Increasing experience has caused me to form gradually the opinion that the histologic diagnosis of syphilis of the placenta is laden with many difficulties, and to question its practical value as a routine method of determining syphilitic infection." He then adds the significant statement, "the more premature the placenta, the more difficult it is to make a diagnosis of syphilis."

In a microscopic comparison of the albuminuric, the syphilitic, and the normal placenta Marc Riviere[11] finds that certain supposedly characteristic lesions are present with such frequency in each of the types that no basis of differentiation can be established.

On the other hand, T. E. Olin[10] after describing certain well-recognized lesions, such as villous hyperplasia (of the stroma cells), leucocytic infiltration, and zonal necrosis of Wharton's jelly in the cord, states: "Since all the above mentioned alterations can occur also without lues, it is impossible always to make a diagnosis on the basis of these alone. Still they are sufficiently definite to make the case suspicious, and when one encounters in the afterbirth side by side a typical villous hyperplasia, so-called miliary abscesses and changes of extensive grade in the fetal cord, one may attribute it with seeming certainty to lues." And Ciulla[3] in a recent x-ray study of the arterial vascularization of the placenta affirms that from his plates he can differentiate the normal, the syphilitic, the albuminuric, and the eclamptic placenta.

One may ask why this confusion and difference of opinion exists concerning syphilis of the placenta. The answer lies, I believe, in the fact that the changes recorded are not true syphilitic lesions. Alterations in structure which have been accepted as characteristic of syphilis may also be found in the placenta of other types of premature stillbirth.

For instance, there are no lesions of the placenta which are comparable to those found in the adult organism or even in congenital syphilis of the child. The finding of spirochetes in the placenta is a rarity, while in the tissues of the baby they are quite common. I personally have pored over slides of the placenta stained with the Levaditi or the Warthin technic for hours at a time with the ever waning hope of finding a single spirochete, and I have yet to see in the literature a photomicrograph of the *Treponema pallidum* taken from a histologic section of the placenta. While these organisms are found in the cord, particularly in the fetal extremities of the cord, and recent reports have shown their presence upon dark-field scrapings of the umbilical vein, yet their discovery in the placental substance happens so infrequently as to be of negligible value pathologically.

From my examination of specimens of syphilitic placentas, I find three conditions which are frequently present: first, a preservation of

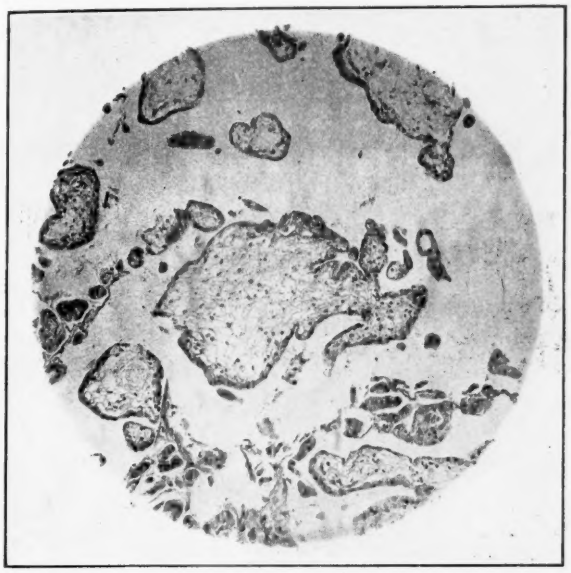

Fig. 1.—Placental villi at the fourth week of pregnancy. Note the free growth of chorionic epithelium, the jellylike stroma of the villi, and the infrequency of cellular elements in the latter. (×100)

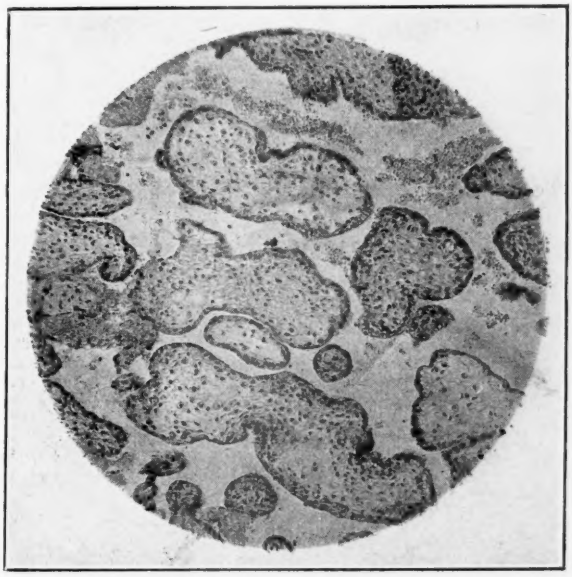

Fig. 2.—The placental villi of spontaneous miscarriage. (Nonsyphilitic patient.) Langhans' cells and syncytium well preserved; more cellular elements in mesoblastic stroma; capillary formation still limited. (×150)

the syncytial covering of the villi with unusual absence of the necrosis or intervillous fibrin deposit which characterizes the average

Fig. 3.—Placenta of inevitable miscarriage at fourteen weeks. (Patient aged 19, gravida ii; 1 previous miscarriage. Wassermann plus 4; Kahn plus 4.) Langhans' cells and the syncytium well preserved; limited number of cells of mesoblast; slight edema of villous stroma. (×150)

Fig. 4.—Histology of placenta at twenty-four weeks. (Patient aged thirty years; Wassermann and Kahn negative; 2 previous pregnancies, full term, living; spontaneous miscarriage at six lunar months.) Langhans' layer has disappeared; villi are still quite large; note extreme density of cellular elements in villous stroma and few small capillaries. (×150)

full-term placenta; second, an increased cellularity of the villous stroma; and, third, edema of the villous stroma (Fig. 5). The two latter conditions, particularly the edema, combine to make the club-shaped blunt villi which are so frequently described, add weight to the placenta out of all proportion to the fetus, and confer upon the organ its pale "greasy" appearance. Inasmuch as syphilis is one of the most frequent causes of premature stillbirth, this architectural structure of the placenta has come to be associated with the picture of syphilitic stillbirth. The same appearance, however, may be associated with other causes of stillbirth, particularly where the death of tissue was primary in the fetus.

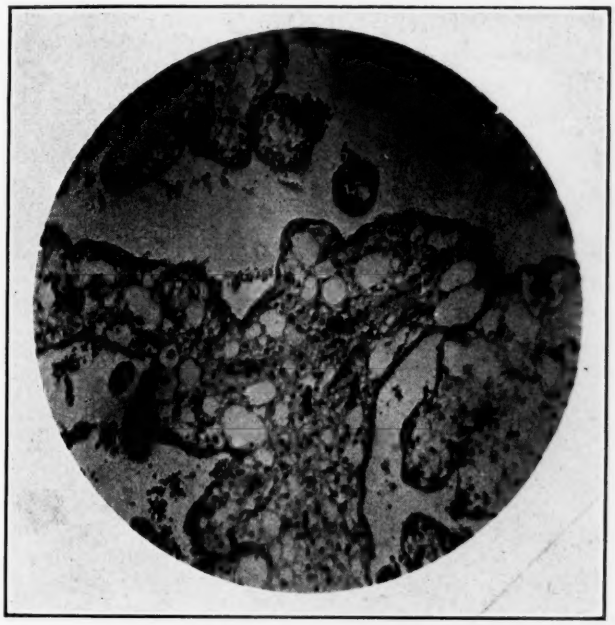

Fig. 5.—Placenta of miscarriage at twenty-six weeks. (Patient aged thirty-nine years; gravida viii; 7 previous macerated stillbirths ranging from the sixth to the eighth month of pregnancy; Wassermann and Kahn negative.) Note the edema of the villous stroma. Practically the same histologic picture as Fig. 4 except for the dilated tissue spaces. (×150)

I am of the opinion that those histologic changes which we have attributed to syphilis are due to nothing more than the immaturity of the placenta and the accumulation of edema. To substantiate this view, I have studied histologic sections from placentas of syphilitic patients in whom stillbirth occurred at various periods of pregnancy and compared them with the histologic appearance of the placenta, in which arrest of pregnancy has occurred at corresponding periods and due to other causes. One finds great similarity between the appearance of these parallel examples (Figs. 1 to 11).

Fig. 6.—Histology of placental villi at thirty weeks. (Patient aged sixteen years; Wassermann and Kahn negative; gravida ii; 1 previous full-term normal child; premature labor incited in this pregnancy by intercourse.) No increasing vascularity of stroma.

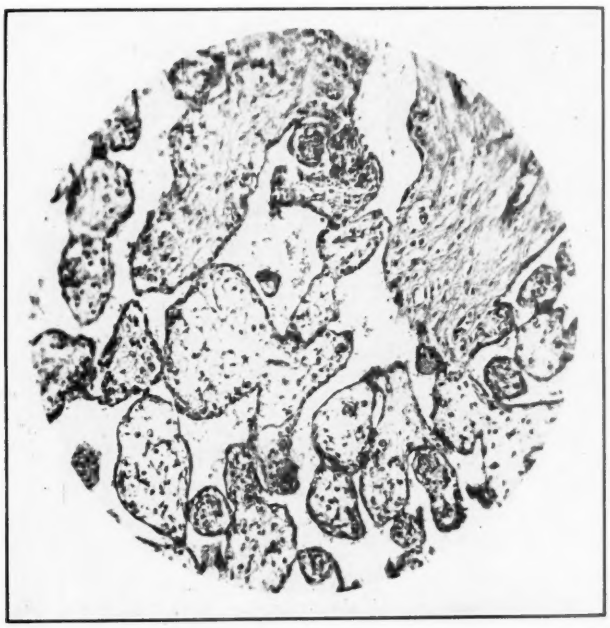

Fig. 7.—Placenta of macerated stillbirth at thirty-two weeks. (Patient aged twenty-eight years; gravida ii; 1 previous miscarriage; fetus macerated and evidently dead for three or four weeks; x-ray of long bones positive for syphilis, although maternal Wassermann and Kahn negative.) Histology similar to placenta of thirty weeks (see Fig. 6) except for presence of edema in villous stroma.

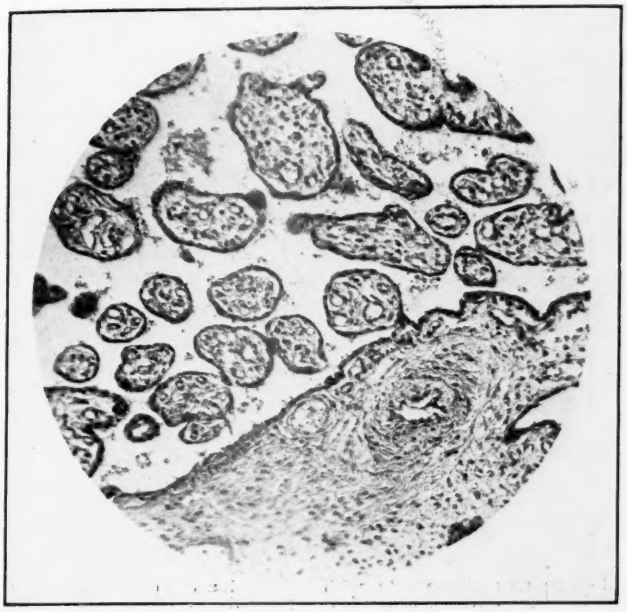

Fig. 8.—Placental villi of stillborn premature baby at thirty-six weeks. (Patient aged twenty-three years; gravida iii; 1 stillbirth, 1 cong. syphilitic baby; Wassermann and Kahn plus 4.) The villi are larger than at full term, syncytium well preserved, stroma rather cellular, capillaries small.

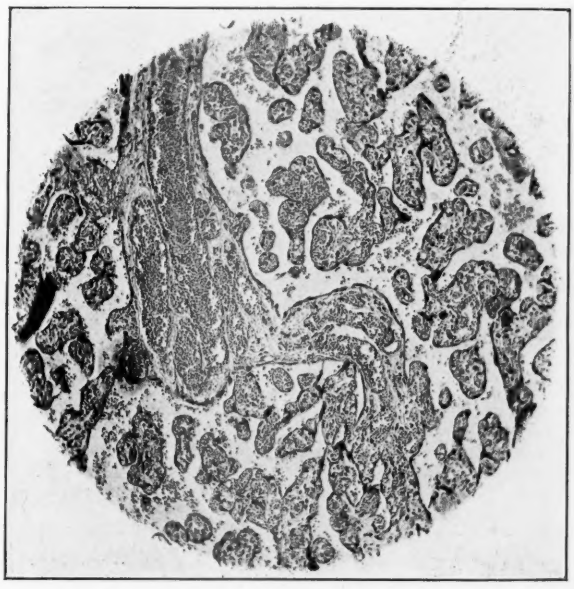

Fig. 9.—Full-term normal placenta with distention of the vascular tree. (×150)

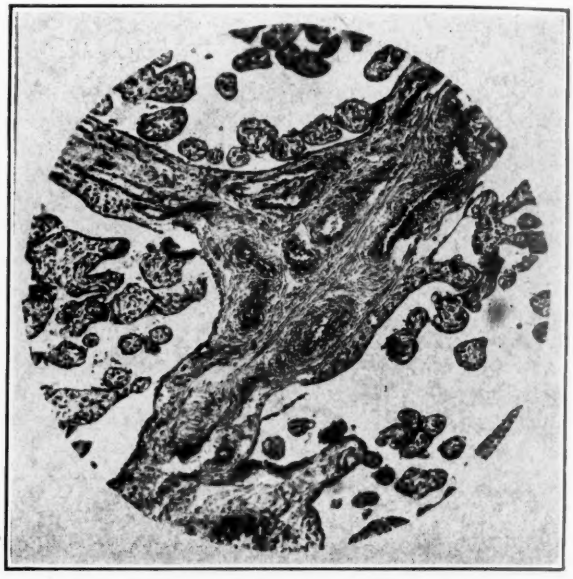

Fig. 10.—Full-term normal placenta with exsanguination of the vascular tree. Note the apparent fibrosis of the placental vessels. (×150)

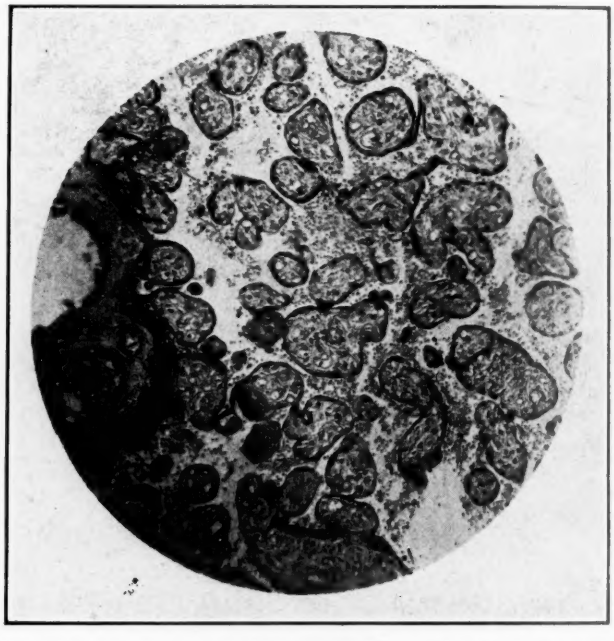

Fig. 11.—Placenta of full-term syphilitic stillbirth. (Gravida viii; 4 previous stillbirths. Wassermann plus 1; Kahn plus 3. Had previous short series of treatments for syphilis.) While the fetus was born at term, it had been dead for some time and the placenta shows evidences of slight immaturity as compared with Fig. 9 or 10. (×150)

If one reviews briefly the embryologic development of the placenta, he will be impressed by the influence which the maturity of the organ has upon its microscopic appearance. At three weeks of pregnancy, we find that the villi are large and irregular in shape, the chorionic epithelium consisting of a basal layer of Langhans' cells and a superficial layer of syncytium. The mesoblastic core of the villi consists of a myxomatous tissue in which cellular elements are few and capillaries are lacking (Fig. 1). At the twelfth week of pregnancy the villi are somewhat smaller and more symmetric in contour, Langhans' layer is still fairly well preserved, the syncytial layer is still present, and the mesoblastic core contains a liberal distribution of cells whose oval nuclei are vesicular in character, the latter constituting the un-

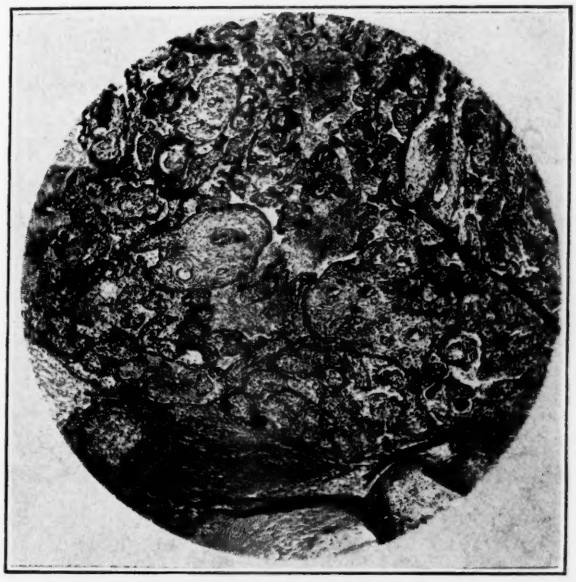

Fig. 12.—Placental vessels and villi and the margin of the placenta. Note the regressive changes in the arterial walls with almost complete obliteration of the lumen. (×125)

differentiated primary cells of the mesoblast (Fig. 2). At this stage a few small capillaries may be observed. At twenty-four weeks of pregnancy Langhans' layer has disappeared, the syncytium is still well preserved, and the villi are somewhat smaller in size (Fig. 4) though quite coarse in comparison with the full-term villus (Fig. 9). At twenty-four weeks the villous stroma is richly endowed with mesoblastic elements, and the appearance of the section would lead one to believe that a process of organization of the villus was inaugurated. Now if one adds to this appearance of the villus at six months, edema of the tissue spaces due to a failing circulation on the part of a syphilitic fetus, he has a perfect picture of the average syphilitic placenta and of the appearance which holds in each instance of interruption of

the pregnancy, whether due to syphilis or to some other primary disease of the fetus, such as toxemia or acute infectious disease (Figs. 3, 5, and 7).

From this time on to full term the villi subdivide into smaller units, the capillaries grow more prominent, the syncytial covering thins out into an endothelial-like membrane, and the primary cells of the mesoblastic stroma, for some unknown reason, disappear; whether the latter are absorbed entirely from the villous stroma, attenuated into connective tissue strands, or applied to the margin of small vessels as a part of their connective tissue wall, I cannot say.

In addition to these features of the stroma, which I consider to be evidences of only immaturity of the placenta, I have never been able

Fig. 13.—Section of a vessel which has collapsed and undergone almost complete obliteration. It was selected from an extensive area of necrosis of the placental villi. (×350)

to identify true vessel wall lesions, such as one would find in syphilis of the adult. In my opinion there are only two lesions which occur in the vessels of the human placenta. The first of these is an acute inflammation which takes place during the course of labor or upon premature rupture of the membranes. This inflammation is characterized by a diffusion of leucocytes in the wall and perivascular spaces of the cord, in the margin of the placenta, and beneath the fetal surface of the placenta. Such a lesion is a manifestation of acute reaction to trauma or bacterial invasion, and the microscopic appearance reveals neither lymphocytes nor any of the features which characterize syphilitic vasculitis. These acute lesions of the placenta and the placental

vessels have been described by several authors,[6, 9] and I have made mention of them and submitted photomicrographs in a recent publication.[2]

The second type of lesion which I have observed in placental vessels is that which takes place upon the disintegration or collapse of the field to which the individual vessel is distributed. This regressive obliteration of the vessel we find occurring physiologically at the margin of the placenta. We find it also among the vessels adjacent to areas of massive necrosis and in instances of missed abortion when a widespread degeneration of the placenta has taken place. These alterations are similar in nature to that which takes place in umbilical and hypogastric arteries after the fetus is born. They are not mani-

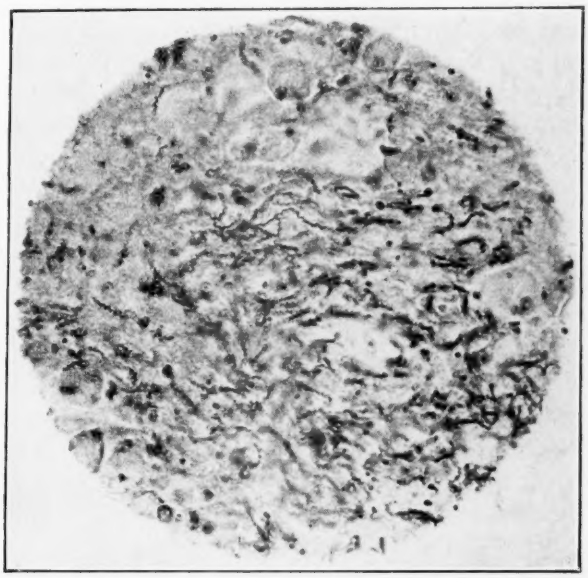

Fig. 14.—Section of fetal liver from macerated stillbirth with congenital syphilis. The necrotic organ is riddled with spirochetes. One never finds this picture in the placenta.

festations of chronic inflammation. These vessel lesions also have been described.[9] While they may be present in the syphilitic placenta as well as in the normal placenta, I find nothing about them which is an indication of syphilitic disease.

SUMMARY

The question is raised as to the significance of so-called "fibrotic lesions" of the placenta. A review of the cases in which diagnoses of "diffuse fibrosis of placental villi" and "perivascular fibrosis of placental vessels" were made, reveals that the fetuses born at or near term were of average weight and that the rate of stillbirth was no higher than could be accounted for by other specific causes.

A reconsideration of the histologic sections leads the author to doubt that either one of the lesions described is a pathologic entity. He sets forth several circumstances which confer upon the placenta a false appearance of fibrosis, namely: normal variation in architecture between different placentas, variation between individual sections of the same placenta, collapse of the vascular tree of the placenta, and states of immaturity of the organ.

Particular objection is raised to the practice of loosely applying the term "fibrosis" to indurated areas of the afterbirth. These areas are found upon microscopic examination to be zones of necrosis or of intervillous thrombosis.

Attention is then directed to "lesions" of the syphilitic placenta: hyperplasia of the connective tissue stroma and vessel wall alterations. The author finds no disturbances here which can be directly attributed to syphilis as a disease. Instead he interprets these "lesions" as evidences of arrest of development of the placenta due to arrest of fetal vitality. He finds precisely the same appearances in stillbirths of the same period due to other causes.

CONCLUSIONS

1. Fibrosis of the placenta and its vessels is not a pathologic entity.
2. Recognition of such lesions is a misinterpretation of placental histology, and their apparent presence has no effect upon the growth or vitality of the fetus.
3. While the human placenta may transmit the organism of syphilis from an infected mother to the embryo, it seems possessed of some peculiar resistance to the development of true syphilitic lesions in itself.
4. Although the placenta of the syphilitic stillbirth is usually large in proportion to the fetus, is light in color, presents a greasy surface, and reveals upon microscopic examination large fibrotic villi, these same characteristics occur in most premature stillbirths and cannot be accepted as criteria of any specific disease.

Acknowledgment.—I wish to express my gratitude to Professor P. Brooke Bland for his interest and encouragement, and for aid in the providing of materials and technical help to conduct these investigations.

I am also deeply indebted to the personnel of the Laboratories of Pathology of the Jefferson Hospital for their assistance, particularly the Director, Dr. Baxter L. Crawford, and his associate, Dr. Carl J. Bucher.

1930 CHESTNUT STREET

REFERENCES

(1) *Agueci, Auerelio:* Pathologica **23:** 413, 1933. (2) *Castallo, Mario A., and Montgomery, Thaddeus L.:* AM. J. OBST. & GYNEC. **30:** 37, 1935. (3) *Ciulla, U.:* Folia Gynaecologica-Demographica **31:** 641, 1934. (4) *Fryemura, Gencho:* J. Morph. **35:** 485, 1921. (5) *Karsner, Howard T.:* Human Pathology, ed. 3, Philadelphia, 1931, J. B. Lippincott Co. (6) *Kobak, M. S.:* AM. J. OBST. & GYNEC. **19:** 299, 1930. (7) *McCord, J. R.:* AM. J. OBST. & GYNEC. **28:** 743, 1934. (8) *Montgomery, Thaddeus L.:* AM. J. OBST. & GYNEC. **21:** 157, 1931. (9) *Montgomery, Thaddeus L.:* AM. J. OBST. & GYNEC. **25:** 320, 1933. (10) *Olin, T. E.:* Arb.

a. d. Path. Inst. d. Univers. Helsengfors 6: 377, 1931. (11) *Riviere, M.:* Gynec. et obst. 22: 481, 1930. (12) *Runge, H., and Hartman, H.:* Arch. f. Gynäk. 39: 51, 1929. (13) *Strachan, Gilbert L.:* J. Obst. & Gynec. Brit. Emp. 30: 611, 1923. (14) *Lawrence, J. Stuart:* AM. J. OBST. & GYNEC. 25: 633, 1933.

DISCUSSION

DR. JAMES R. McCORD, ATLANTA, GA.—Up to the present time I have examined some 3,000 placentas and about one-half of them have been from women with a strongly positive blood Wassermann reaction. Formerly I believed that there was a definite histologic appearance of the placenta that was a constant pattern for syphilis, but I no longer think that is true. I still believe, however, that in a placenta, at or about term, where there is definite crowding of the villi, absence of the blood vessels, and an increase of stroma cells, the condition is usually syphilitic. The more premature the placenta the greater the difficulty one encounters in making a diagnosis of placental syphilis.

In studying placental syphilis it is important that one cut his own sections, taking several from different parts of the placenta. I have always been wary of the diagnosis of placental syphilis from one small, suspicious part when the rest of the placenta appeared to be normal. There are, however, other methods that are better which should be used in the diagnosis of congenital syphilis, finding of the organisms of syphilis in the baby and, more particularly, the long bone changes as revealed by the x-ray.

I have been more fortunate than Dr. Montgomery in that I have found the organisms of syphilis in several placentas although I have made relatively few such examinations. I have found the organisms of syphilis in the placenta when I could not prove that the baby was syphilitic; and, I have been unable to find the organisms of syphilis in the placenta when I had proved that the baby was syphilitic.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—A sufficient number of placental sections are often not read to give the entire story of its pathologic changes, and the selection of sections from the gross specimens will often predetermine the conclusions that will be reached in the study of the sections.

In regard to the question of fibrosis, tissues will differ according to their inheritance quality. They will also differ, of course, in accordance with their nutrition, other factors that are purely pathologic, but most changes in the placenta are largely dependent upon the vascular supply. One may find the vascular supply in one section very efficient and in another very inefficient. The stromal content of the tissue in one zone may also vary from that in another zone. The chorion laeve zone and the perivascular areas will show relatively more connective tissue, and this again is directly dependent upon the vascular supply.

DR. MONTGOMERY (closing).—Dr. McCord has made the statement that the diagnosis of syphilis from the examination of the placenta is made more easily at full term than in the premature baby. This, I think, is particularly true when the baby is stillborn, and has perhaps been dead for a period of four to six weeks or more, in which instance we find the indications of immaturity of the placenta, which have so frequently been mistaken for evidences of chronic inflammation.

Only two types of vessel lesion are detected in the placenta: first, acute inflammation, which is characterized by an infiltration of leucocytes and is associated with long labor, premature rupture of the membranes, and trauma of operative delivery; and, second, collapse and obliteration of fetal vessels, a regressive change which is found in the neighborhood of massive areas of necrosis of the placenta. In previous contributions I have taken the stand that the collapse and obliteration of the fetal vessels is secondary to the necrosis of the corresponding villi, rather than the cause of it.

OPERATIVE TREATMENT OF URINARY INCONTINENCE*

MARION DOUGLASS, M.D., F.A.C.S., CLEVELAND, OHIO

(From the Department of Obstetrics and Gynecology, Western Reserve University School of Medicine, and the Lakeside Hospital)

SINCE 1928 we have been interested in the problem of urinary incontinence and its methods of treatment, and during that time have treated and followed carefully a series of cases of its various types. A number of surgical methods, most of them standard operations, have been employed and a few modifications, devised for individual cases, have been given a trial. The subject is rather specialized and might seem to be of limited interest, but many cases of urinary incontinence are so hopeless often and so eager for surgical relief that a consideration of operative methods seems worth while. Urinary leakage is one of the most troublesome ailments with which patients are ever afflicted. The mechanism of urinary control, which under normal circumstances functions so perfectly, is rarely appreciated until due to relaxation, accidents or disease, it becomes functionally incompetent or organically damaged.

Since the time of Rounhuise in the latter part of the seventeenth century there have been consistent attempts to improve upon the operative methods which may be employed in dealing with urinary leakage. The history of vesicovaginal fistula primarily due to the work of its pioneer surgeon, Marion Sims, is best known in the surgery of urinary leakage, but the advances made and cures obtained through the efforts of Kelly. Ward, Rawls and others have so improved surgical attack that almost any patient may be promised great improvement or even a clinical cure although several surgical procedures may be necessary. Crossen has presented detailed descriptions of technic in his volume *Technique of Gynecological Surgery.* Many isolated cases of all types have been reported which have been benefited or cured by many different methods (Young).

Relief of incontinence depends to the greatest extent for its success upon the proper choice of methods in the various types of incontinence. It is the purpose of this paper to give a brief consideration to those types and the methods best adapted to their treatment with the report of some typical cases.

Although vesicovaginal fistulas have been described in mummies as early as the second Egyptian dynasty apparently no suggestions for its treatment were considered until the time of Ambrose Páre in 1570. Marion Sims, in 1850, was the first to employ the three essentials, exposure, closure by suture, and catheter drainage.

*Read at the Forty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons held at Skytop, Pa., September 16 to 18, 1935.

Urinary incontinence usually may be considered under the following headings: those due to (1) congenital or neurogenic causes; spina bifida, extrophy of the bladder, syphilis, cord lesions, congenital defects of the vesical sphincter, ectopic ureters, etc. (2) Acquired defects of the vesical-control mechanism usually (a) trauma or relaxation of the vesical neck (due most often to dystocia, defective tissues, senility, etc., (b) relaxation of vesical neck associated with marked cystocele or prolapse. (3) Vesical fistula with urethra and vesical sphincter intact. (4) Loss of urethra and vesical sphincter.

Several considerations are important in the treatment of these cases. Certain patients cannot be classified as absolutely cured. Especially is this true in cases where there is a lesion or functional incompetence of the vesical neck. The simple vesicovaginal fistula either leaks or does not; whereas the patient, who has a synthetic vesical sphincter constructed or who has a normal vesical neck artificially made tighter but under poor nervous control, can scarcely be expected to have a perfect functional result. Repeated operations through scar tissue and the necessity of employing the thinned-out atrophic structures add to the operative difficulties. The anatomy of the vesical neck is insufficiently understood. The vesical neck is produced by thickening of musculature and submucosa which forms a ring about the orifice which functions as a sphincter, i.e., the sphincter vesici internus. In addition, but in the female essentially, continuous with the structure of the vesical neck, there is an external sphincter which is essentially voluntary in function. The hypogastric and pelvic sympathetic nerves carry the impulses, and there is a balanced antagonism of reflex sphincter and bladder muscle stimulation and inhibition. Incontinence as well as acute retention occurs in cerebrospinal syphilis, in cases of congenital defects of the bladder and tumors of the cord.

I. CONGENITAL DEFECTS

Occasionally we see cases of a congenital type of incontinence characterized by incontinence without recognizable anatomic defects. Case 1 shows such a condition. These patients have apparently an uncertain nervous control over the vesical sphincter.

The patient, thirteen years of age, came to the hospital for incontinence of urine. She had been incontinent since birth. There was no history of any urologic disease, and neurologic findings and cystoscopic examination were completely negative. She voided regularly, and had no difficulty in emptying the bladder. There was slight constant dribbling of urine. Ectopic ureteral orifices were ruled out as nearly as possible. Upon withdrawal of urethroscope it was found that the internal sphincter remained open even after the instrument had been withdrawn down the urethra 1 cm. from the internal sphincter. The anterior half of the neck was seen to close but the posterior half remained definitely open. The situation thus being one of mechanical insufficiency, it seemed advisable to attempt to improve the competency of the sphincter by simple plication. This was performed by the Kelly technic consisting of a longitudinal denudation, mattress sutures being placed in the vesical neck and the neck being marked out by the means of a Pezzer catheter. This patient is markedly improved, especially in her diurnal control.

The treatment of extravesical ureters is relatively easily carried out once the diagnosis is made. In general it may be said that the incontinence due to cord lesions in congenital defects cannot be well treated by plastic surgery. Implantation of the ureters into the rectum is advisable, being about the only surgical possibility. This also holds for extrophy of the bladder. I am performing a series of operations on a patient with extrophy at the present time by the transvesical approach.

II. (A) ACQUIRED DEFECTS—TRAUMA AND RELAXATION

By all odds the most common type of relative or intermittent incontinence is relaxation of the vesical neck due to dystocia or defective tissue. This occurs most frequently after extreme dystocia, breech, or difficult forceps delivery, etc. Certain patients seem predisposed to development of urinary incontinence of a minor or intermittent type, i.e., tendency to lose urine when coughing or straining or where the bladder is abnormally full, apparently due to defective tissue.

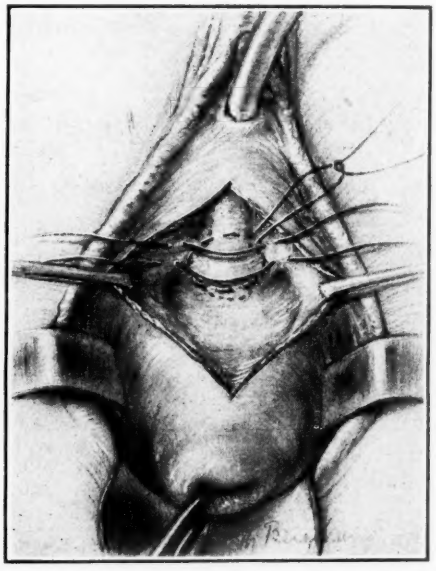

Fig. 1.—Repair of vesical neck where bladder is thin and redundant by means of superimposed purse-string sutures combined with a mattress suture (Kelly).

These cases are seen principally in women who have had numerous rapid pregnancies and in women of advanced years. The Kelly method is usually sufficient. Other methods which may be used are the advancement of the urethra as advocated by Pawlik or twisting of the urethra with advancement. For example, a typical patient is a young woman, twenty years of age, who entered the hospital complaining of incontinence of urine since delivery of her first child with a difficult forceps procedure. Pelvic examination revealed no abnormality except moderate relaxation with a very rigid perineum, and a wire-edge scar completely encircling the lower half of the vagina. The typical Kelly procedure resulted in complete cure.

II. (B) RELAXATION OF VESICAL NECK ASSOCIATED WITH CYSTOCELE OR VESICAL PROLAPSE

There is a distinct group of patients who have marked relaxation of the pelvic floor associated with relaxation of the vesical neck, i.e., a marked cystocele and rectocele with some degree of prolapsus uteri. The problem here is more com-

plicated. Here we have residual urine as well as incontinence often producing vesical irritability, causing loss of urine due to contractions of the bladder which are more or less involuntary. In these cases the relaxed pelvic floor must be repaired as well to support the base of the bladder and urethra. This is necessary to give a lasting result. The type of operation advisable for this procedure may well be the cystocele operation with advancement of the bladder as recommended by Ward. This is carried out by means of advancement of the bladder with the usual T-incision, the fascia is mobilized laterally and the vesical sphincter shortened by the Kelly procedure, and the fascia is then sutured under the bladder after it has been advanced, after which the mucosa is repaired along the usual lines of incision. Certain cases with marked relaxation resist ordinary tightening of the

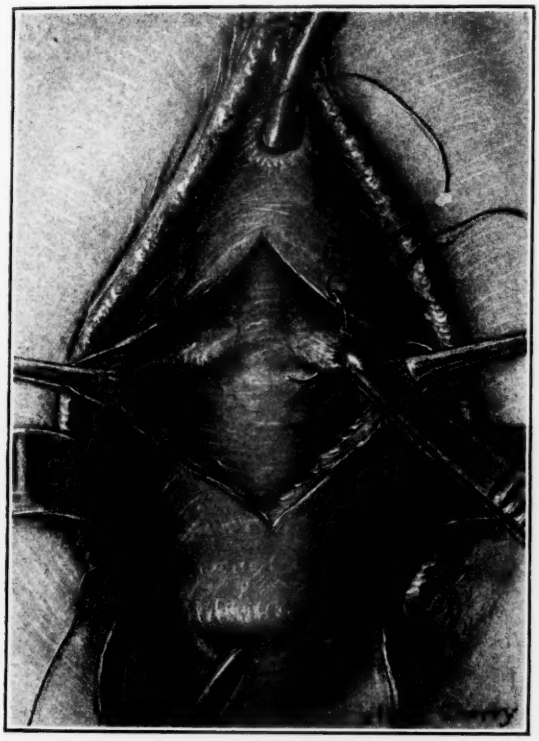

Fig. 2.—Kelly operation. Plication of vesical neck.

sphincter vesici by the commonly used Kelly method. In these there is usually marked thinning of the bladder wall at the vesical neck, i.e., the site of the vesical sphincter which is usually readily distinguished at operation. Where it is very difficult to imbricate the relaxed tissue of the vesical neck about a Pezzer catheter, the trouble lies in the fact that only very small superficial sutures may be taken in placing the mattress sutures employed by the Kelly technic. Unless extreme care is employed there is danger of penetrating the vesical mucosa and a subsequent development of a fistula, a most troublesome and embarrassing accident. This situation may be met by several methods among which are advancement of the urethra or the placing of superimposed small purse-string sutures, invaginating the redundant tissue into the bladder by the method of Gersuny and Saenger. This produces a plug mechanism which aids in restoring the competency of these thinned-

out tissues. This has proved effective in our hands in one case; the patient had been treated first by the Kelly method alone, and then by a modified Kelly technic with advancement of the urethra (Figs. 1 and 2). Of this variety of patients with and without marked cystocele and prolapse, we have had eight patients with a satisfactory result.

III. VESICOVAGINAL FISTULA

As it has been previously pointed out in the early history of the surgery of urinary incontinence, vesicovaginal fistula has dominated the picture. The early work of Sims and Emmet marks the beginning of modern operative treatment. The

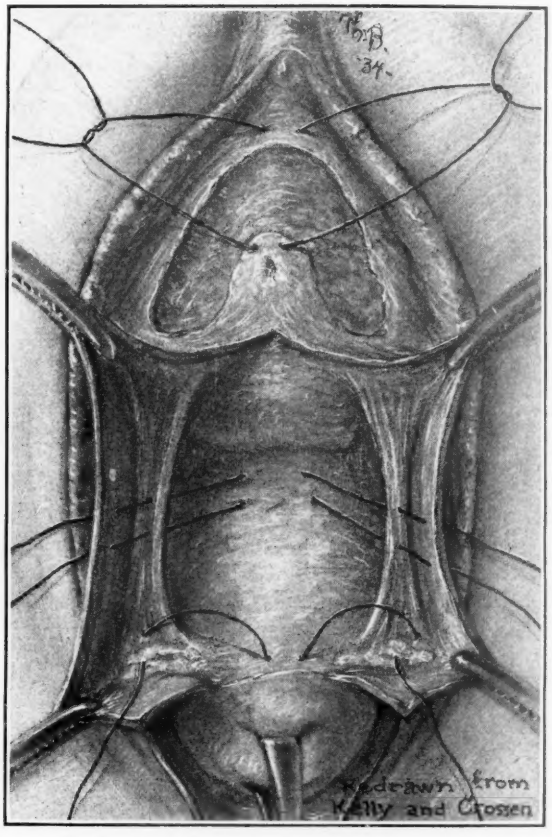

Fig. 3.—Procedure best employed in certain cases of incontinence with cystocele and first degree prolapsus advancement of the urethra (Pawlik) plus advancement of the bladder; Kelly operation may be combined with this.

classical method of Sims, using silver wire, consisted in the essentials of trimming the edges and closure by suture. Rawls, Watkins, and others have advocated flap splitting and mobilization of the bladder in the operative attack. This is much the same as the dissection of the anterior vesical wall and free mobilization of the bladder, which is used by many operators for cystocele repair. It is not in the scope of this paper to mention all the procedures which have been suggested to deal with certain types of fistulas. Kelly, Farrar, Noble, and Ward have devised modifications for various types of fistulas. The transvesical route has been of interest to us, and we are including in this series several successful cases so treated.

In 1927, Young reported a cure of a patient who had had eleven unsuccessful operations during a period of three years. His method is extremely good. Suprapubic incision is made following complete urologic investigation, the bladder incised, the fistula elevated by a hook, circumcised, and closed by purse-string sutures about the finger in the vagina.

We have had three successful cases whose fistulas developed following panhysterectomy and who had had repeated operations by the classical method which we repaired at one procedure by the transvesical route. Suprapubic transperitoneal operations have been advised (Legueu, 1914). The extravesical route is used, the

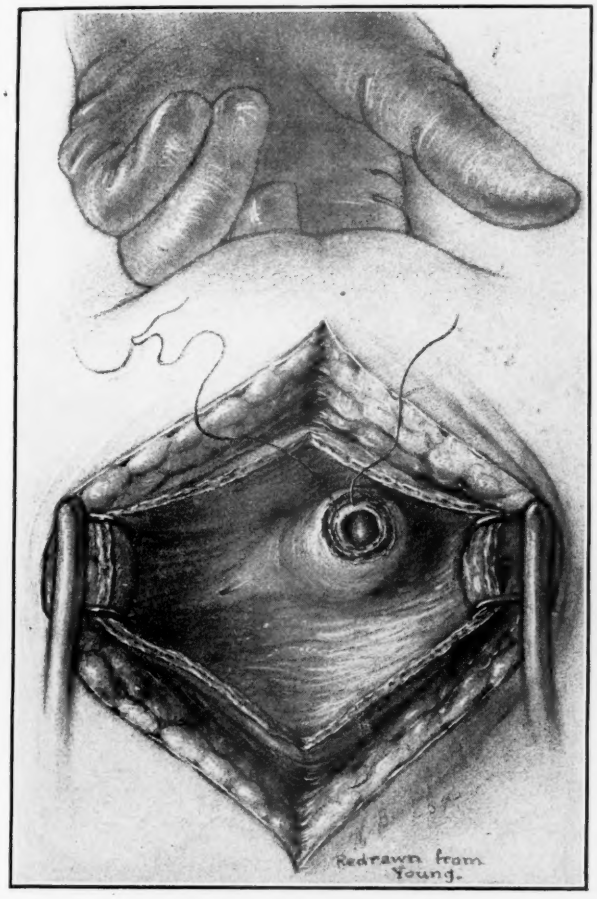

Fig. 4.—Transvesical approach (Young) showing invaginated bladder and purse-string sutures easily placed.

mobilization of the bladder being carried out as in doing a hysterectomy. We have had no experience with this method. In our hands the classical method, with marked mobilization of the bladder and fistula in large fistulas, and the Young operation in certain cases are the advisable procedures.

IV. LOSS OF URETHRA AND VESICAL SPHINCTER

Destruction of the urethra and vesical sphincter are extremely difficult cases with which to deal. Flap operations and many tunneling methods have been used by

Baker Brown, Noble, Sellheim, and many others. Artificial sphincters have been constructed by various methods (Deming, Taussig, Martius, etc.). We reported in detail in 1931 before the American Gynecological Association three cases of complete loss of urethral and vesical sphincter treated by a modification of Taussig's method with almost complete cure within limits of emptying the bladder about every hour. Two of these patients are still under observation and in good condition.

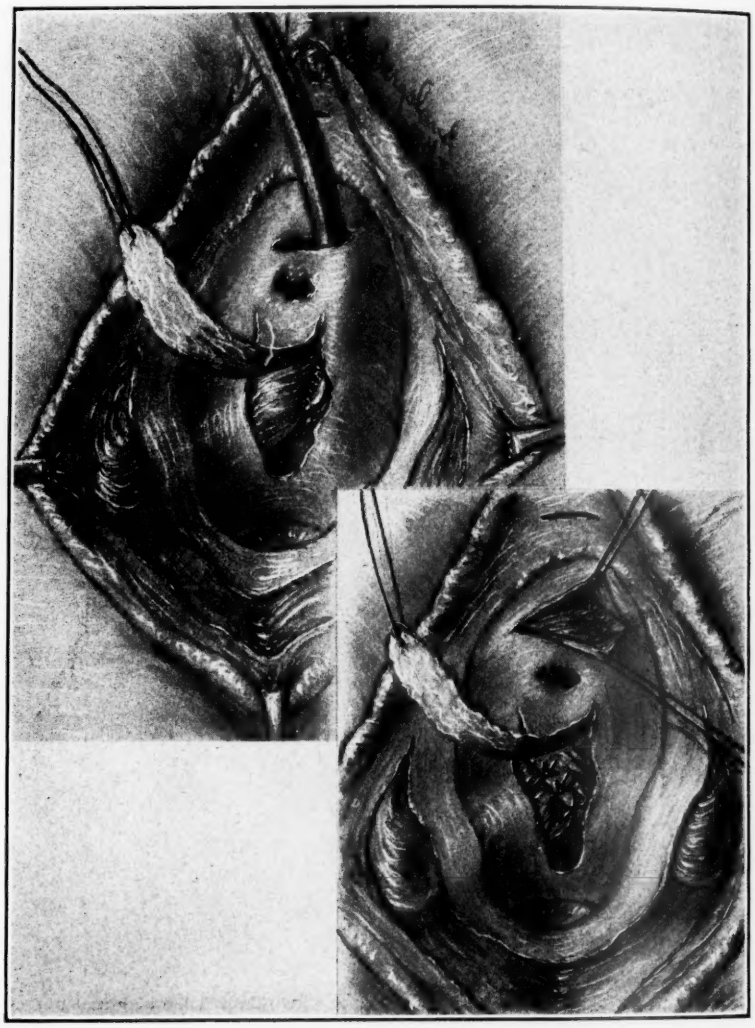

Fig. 5.—Levator flap transplantation (McGaw-Douglass) applicable to certain cases with destruction of the urethra and vesical sphincter may be combined with operation for reconstruction of the urethra.

Since then we have operated upon three more patients, one who is a complete failure, one who is much improved, and one who is cured following four operative procedures. I briefly summarize the methods used in the last case.

The patient is twenty-six years old, incontinence of urine after forceps delivery. She had two unsuccessful attempts at repair at other hospitals. There was complete destruction of the urethral sphincter, it being possible to put the tip of the

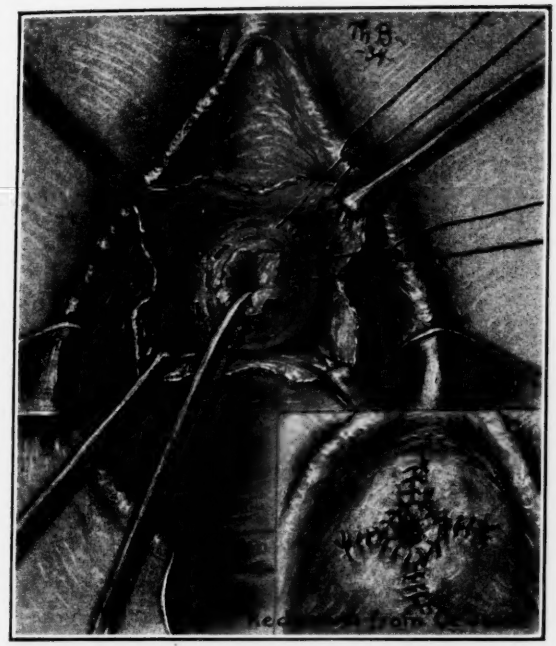

Fig. 6.—Procedure applicable to destruction of the urethra and vesical sphincter, consisting of invagination of the vesical wall inside of successfully tied and invaginated purse-string sutures.

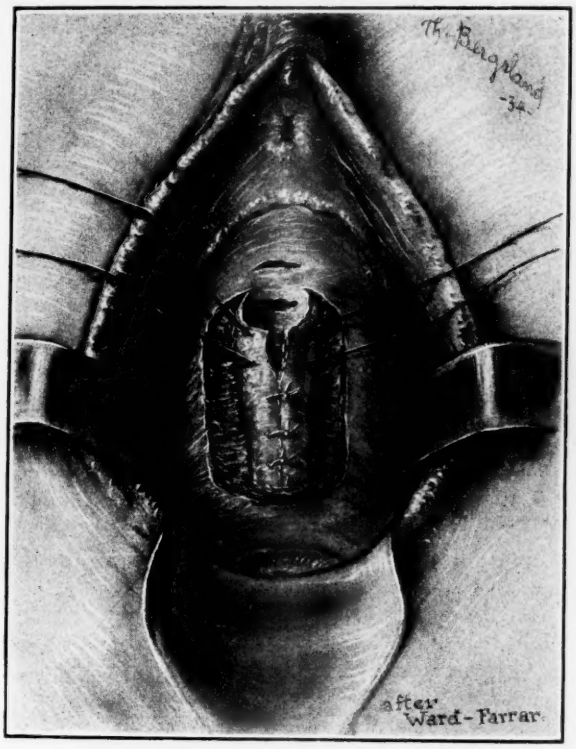

Fig. 7.—The Ward-Farrar operation showing construction of mucosal tube to be placed as new urethra.

forefinger into the urinary bladder. Transplantation of the levator flaps was performed and the patient was discharged completely continent within the limits of emptying the bladder every hour and a half when on her feet. The patient remained continent for three months, when approximately at the time of renewal of her coitus, her incontinence returned, making it necessary for the patient to wear pads constantly. In the next operative procedure it was attempted to narrow the urethra by a horseshoe denudation above the urethra after the method of Pawlik, with narrowing of the urethra. This operation was a complete failure. At the third operation the posterior wall of the urethra could be demonstrated as being approximately 2 cm. in length. An attempt was made to imbricate the presumable site of the bladder neck by a Kelly mattress suture and the use of multiple purse-string

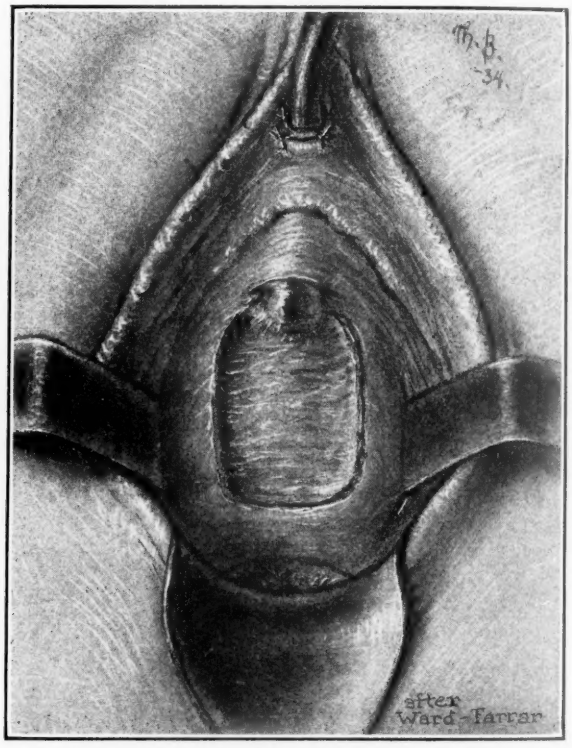

Fig. 8.—Showing tube as synthetic urethra placed in tunnel. This was employed successfully in one patient in this series.

sutures after the method described by Crossen to support the paraurethral structures. Suprapubic drainage was performed. In this case, two and one-half months following discharge from the hospital, the patient stated that she was continent, and had good voluntary control. Within six months the patient was again incontinent. This was due again presumably to the pull on the perineum following resumption of coitus. A fourth operation was performed later and consisted of the Ward-Farrar operation. The new urethra was a complete take and the patient is now continent after one and one-half years. This case demonstrates the difficulty met with in dealing with cases of absent sphincter and urethra and illustrates to some extent how the attack must be modified according to the tissues which are available to the operator at successive operative procedures.

In summary I wish to emphasize that treatment of urinary incontinence demands patience, care in details of technic, and proper choice of methods.

REFERENCES

(1) *Bonney, V.:* J. Obst. & Gynec. Brit. Emp. **30**: 358, 1923. (2) *Deming, C. L.:* J. A. M. A. **86**: 822, 1926. (3) *Dougal, D.:* J. Obst. & Gynec. Brit. Emp. **31**: 46, 1924. (4) *Furniss, H. D.:* S. Clin. North America **5**: 249, 1922. (5) *Kelly, H. A., and Dumm, W. M.:* Surg. Gynec. Obst. **18**: 44, 1914. (6) *Taylor, H. C., and Watt, C. H.:* Surg. Gynec. Obst. **24**: 296, 1917. (7) *Taussig, F. J.:* AM. J. OBST. & GYNEC. **77**: 881, 1918. (8) *Van Duzen, R. E.:* Urol. & Cutan. Rev. **36**: 187, 1932. (9) *Watson, B. P.:* Brit. M. J. **2**: 566, 1924. (10) *Witherspoon, J. Thornwell:* Arch. Surg. **28**: 548, 1934. (11) *Young, E. L.:* J. A. M. A. **79**: 1753, 1922. (12) *Young, H. H.:* Surg. Gynec. Obst. **28**: 84, 1919.

2065 ADELBERT ROAD

DISCUSSION

DR. LOUIS E. PHANEUF, BOSTON, MASS.—In difficult cases, where other methods have failed, the extraperitoneal approach through a Pfannenstiel incision may be successful. This particular method, which is not mentioned in Dr. Douglass' paper, has served me well in one case, where I successfully closed a bladder fistula after having failed at five previous operations performed through the vagina and through the bladder.

My experience differs from that of the essayist in the use of the transvesical route in the closure of a vesicovaginal fistula. He reports three cured cases; I have used the method four times and failed each time.

The vesical sphincter is a poor sphincter at best and the results obtained by surgical procedures on the neck of the bladder depend, to a great extent, upon the condition of the tissues at the time that operation is performed. I have found the Kelly technic satisfactory in a number of these patients, the best results being obtained in those women who were operated upon early after the appearance of incontinence, before the tissues had undergone marked atrophy. My poorer results were obtained in the group of older patients where there was so much loss of sphincter tissue that shortening of this structure gave but little control.

At the 1924 meeting of this Association, held in Cleveland, H. Dawson Furniss presented an ingenious method of suprapubic sphincter tightening through a median, extraperitoneal suprapubic incision over a Pezzer catheter. He claimed to have obtained the idea from F. C. Holden who in turn had obtained his idea from Todd of Texas. This method is useful where the vagina is very contracted, where the vaginal mucosa is thinned out, where a previous Kelly operation has failed, and where the Watkins interposition operation and other operations for cystocele and vesicovaginal fistulas have previously been performed.

Repair of the pelvic floor, as advocated by Dr. Douglass, is important where there is marked relaxation of the vagina, the repaired pelvic floor obviously giving support to the base of the bladder and urethra.

I am in complete agreement that the best treatment of extravesical ureters and exstrophy of the bladder is implantation of the ureters in the rectum.

Like Dr. Douglass, I feel that the results of the treatment of urinary incontinence depend on the choice of the proper procedure, a meticulous technic and painstaking after-care.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—Years ago, most of these lesions were due to labor, and the vaginal route was naturally the easiest and safest, for at that time any intraabdominal procedure was dangerous. With the development of abdominal surgery and an increase in the number of hysterectomies, there has been

an increased number of bladder and ureteral lesions at higher levels. In these it is often much more difficult to reach them from below than by approaching them from above. In performing a panhysterectomy, the free exposure of the bladder which is usually undertaken at that operation, will illustrate how easy it may be to reach and repair some of these fistulas.

It is advisable to explain to the patient that the repair of a fistula may be exceedingly difficult and may require several different attempts before its closure is effected. Otherwise, she is very likely to become discouraged and resort to some other operator if the first attempt has failed.

When one considers how easily the mechanism of sphincter control can be disturbed, even with perfectly normal anatomic conditions, as for instance, the retention of urine after an operation, one can see how it may be impossible to get an ideal operative result when the bladder is actually diseased. Fortunately, most of these nervous disturbances of vesical control are in the nature of a retention rather than incontinence, the former being far less distressing to the patient, and much more easily dealt with.

DR. DAVID W. TOVEY, NEW YORK, N. Y.—Operating upon a fistula from above in an obese woman is like working at the bottom of a well. By using the Schuchardt incision the fistula is on top and it is not necessary to work through a small opening. There is no need to use the complete incision, but with a modified one there will be easy access to the trouble. It is almost like working in the perineum.

DR. LEWIS F. SMEAD, TOLEDO, OHIO.—I have seen a good many cases of mild incontinence in my female patients in which there was no anatomic disturbance. In fact, many of them are nulliparous patients. The urine is clear and contains no pus. I have found that these patients can be cured in the majority of cases by urethral instillation of silver nitrate of 1 to 2 per cent. They are cases of edema or chronic irritation of the bladder neck.

DR. HENRY SCHMITZ, CHICAGO, ILL.—To render these fistulas accessible through the vagina a uterine dilator is placed through the urethra into the fistula. Thus the fistula can be brought down into the vaginal outlet. Dissection and suturing of the layers are thereby facilitated.

DR. A. J. WINEBRAKE, SCRANTON, PA.—I recently had a patient with a large vesicovaginal fistula that had been operated upon three times unsuccessfully. On inspection of the vagina the bladder was seen to be prolapsed through the opening and the two ureters were spurting urine. What to do was a question. The following technic was used: A fairly heavy rubber balloon was used and the neck of the balloon was pulled through the urethra, leaving the body of the balloon in the bladder. With a little air in the balloon I was able to push the prolapsed bladder back into place. On inspection, after increasing the air in the balloon, I found an opening in the vagina the size of a quarter, and with the red balloon as a background, I was able to make a complete dissection and place the sutures to good advantage, letting the air out of the balloon before the sutures were tied.

There is additional advantage that you can inflate the bladder to a considerable size before operating. This will increase its capacity by breaking up adhesions which have formed in a bladder which has been collapsed for a long period. Your assistant can place pressure on the lower abdomen and you will be surprised how this brings down the opening in the bladder and gives you a splendid exposure. There was primary union in my case and the sutures were removed in six days. This patient retained her urine six hours after removal of the catheter and after one week, she did not have to get up at night. Such a technic gives a beautiful exposure and is a simple procedure.

DR. FREDERICK H. FALLS, CHICAGO, ILL.—I have found that it is a good plan to use the balloon in the bladder preoperatively, to get the mobilization of the bladder wall.

There is one type of incontinence that should be considered—the type due to spina bifida. We had a colored girl with a spina bifida who had also a marked deformity of the lower extremities. Nothing could be done for her in the orthopedic department, because she had a sloughing ulcer of the buttocks due to the fact that she had sat in urine all her life. I could not operate from below on account of the lack of exposure, due to the deformities. I made a suprapubic incision, separating the recti muscles and then taking a strip from each side of the rectus fascia, sewing the strips together. With a finger of an assistant in the vagina as a guide I next made an attempt to pass a silk ligature with an aneurysm needle, underneath the urethra. Failing this, I passed a curved forceps underneath the urethra, got the fascial strip through, brought it up, and sewed it to the edge of the rectus muscle. Then when she kept the back straight it kinked the urethra and she was able to hold the urine for a period of two or three hours and she could be kept dry practically all the time during the day. The ulcerated area on the buttocks rapidly cleared up. The bladder capacity was 180 c.c.

DR. DOUGLASS (closing).—I did not mean to give the impression that I advocated the transvesical approach. I do not hesitate to use the Schuchardt incision on any case that is inaccessible, but there are certain cases where the transvesical approach gives better exposure.

As to the postoperative treatment of these patients, we keep the patient on the abdomen for practically a week, keeping the urine well acid to prevent incrustation of the sutures. I do not hesitate to do a suprapubic drainage where necessary. It often adds to the improvement materially.

Schroeder, Carl: Hysteroscopy and Its Value, Arch. f. Gynäk. **156:** 407, 1934.

The author reviews the various attempts which have been made to popularize hysteroscopy during the last few years and explains that the objections have been difficulties in technique plus false impressions of the dangers involved. The author describes his hysteroscope, which is simple and direct, and is used under water irrigation as have been those previously described.

Careful studies have convinced the author that there is no danger of any of the water being spilled or forced out into the tubes, and the hysteroscope should therefore be used under continuous water irrigation as the inspection of the uterine cavity is markedly improved thereby.

The various changes in appearance of the uterine mucosa throughout the various stages of the menstrual cycle are described and illustrated with color charts. The uterine ostium of the tubes is also shown throughout the menstrual cycle. Attempts were made to close the tubal ostia by electrocoagulation but these attempts failed, due probably to the tremendous regenerative properties of the mucosa in these areas. The author does not believe that a reliable method of sterilization by the intrauterine approach can be found.

Hysteroscopy is indicated whenever intrauterine pathology is suspected, and it is of special value in replacing roentgen visualization of the uterine cavity, since it is easier, safer, and cheaper.

RALPH A. REIS.

THE REDUCTION OF MORTALITY IN ECTOPIC GESTATION*

CHARLES A. GORDON, M.D., F.A.C.S., BROOKLYN, N. Y.

MORE than fifty years have elapsed since Lawson Tait[1] first operated upon a patient with a diagnosis of ectopic rupture. Only eight years later Schauta[2] in 1891 demonstrated that prompt operation had reduced mortality from 86.9 to 5.7 per cent. When Hunter Robb,[3, 4] nearly thirty years ago, showed that both uterine and ovarian arteries and veins might be severed without killing experimental animals, he for a while stemmed the tide of immediate operation which by then had become general practice. The mortality of the expert operators of his day, he said, was 40 to 50 per cent in patients in shock. He was convinced that many patients lost their lives from the operation alone, that only very rarely, possibly never, could a patient be saved by operation when the blood loss itself was sufficient to cause death. He taught that death was due to shock, fresh hemorrhage, to manipulation, and relief of abdominal tension by laparotomy; the sudden removal of a large quantity of blood before the vessels had time to become adjusted to altered conditions was dangerous.

Robb's views were never generally accepted. Although many of his views have not been properly refuted, the bitter controversy raised by him has for the most part been forgotten. Death is due to hemorrhage, not shock, yet the statistics of those who await reaction compare very favorably with the results of immediate operation. Many gynecologists rarely lose a patient. It is, I believe, generally held that the mortality of ectopic gestation is well under control, but is it? What are the facts?

Recent publications of maternal mortality statistics show a surprising number of deaths due to ectopic gestation. It seems that the mortality is formidable enough. The New York Academy of Medicine[5] report on New York City for 1930 to 1933 listed 120 deaths from ectopic gestation, 5.9 per cent of the total maternal mortality. The Philadelphia[6] report considering 717 maternal deaths for 1931 to 1933 reported 33 ectopic deaths, 4.6 per cent of the total, or 11 per cent of the cases under twenty-eight weeks. The Children's Bureau *Study of Maternal Mortality in Fifteen States*[7] for 1927 and 1928 in 13 states, and for 1928 only in 2 more states, attributed 314 deaths to ectopic gestation, or 4 per cent of the total 7,380; deaths from hemorrhage of placenta previa were but 347, and deaths from postpartum hemorrhage 374.

*Read at the Forty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons held at Skytop, Pa., September 16 to 18, 1935.

It has been said that "this condition once rarely cured is now one which rarely ends in death, a triumph of modern gynecology."[8] It is obvious however that this is not the case. Since nearly 6 per cent of the maternal mortality of the City of New York is due to ectopic gestation, discussion of the factors involved seems worth while. In fact the New York Committee felt "that in view of the large number of deaths from this cause an exhaustive study of the whole subject would prove extremely valuable." It is probable too that the incidence of ectopic gestation will increase. It should be easier to reduce the not inconsiderable ectopic factor than the other rates involved in the problem of maternal mortality.

TABLE I

	15 STATES	NEW YORK	PHILADELPHIA
Total maternal mortality	7,380	2,041	717
Ectopic deaths	314	120*	33†
Per cent ectopic deaths	4%	5.9%	4.6%
Died without operation	109 (34.7%)	29 (24.1%)	7 (21.2%)
Deaths from sepsis	65 (31.7%)	35 (30.4%)	8 (30.8%)
Symptoms 5 days or more	84%	79.1%	Majority

*74.2 per cent preventable, 82% physician responsible.
†66.7% preventable, 72.7% physician responsible.

These important studies invite consideration. It is not possible to draw definite conclusions, but interesting observations may be made. Not all the ectopic deaths are included, for the Children's Bureau assumes that some deaths are not properly assigned, especially in rural areas where hospitalization is less frequent. On the basis of 16,000 deaths annually assigned to pregnancy and childbirth, it is likely that about 1,000 women die from ectopic pregnancies every year. That symptoms were present for five days or more in most of these cases is significant but not surprising. That one-third of all the operative deaths were due to sepsis, and 30 per cent of all the patients were never operated upon at all, is astonishing. Transfusions were few, only 36 in 314 cases in the federal study. Gratuitous surgery and multiple operations were all too common, both the Philadelphia report and the Children's Bureau condemning removal of the appendix in the presence of blood in the abdomen. The high rate of the City of New York means either more serious cases or poorer or less fortunate surgery.

Except in Philadelphia these reports review ectopic deaths only. It is impossible to estimate total clinical experience, since the results of most operators are never published. American statistics of the last ten years of those reporting their mortality in at least 100 cases are tabulated, since in no other way at present can the results of treatment be shown.

No clear deduction can be made from the figures in Table II. The average mortality of 4.6 per cent is surpassed by those who practice immediate operation, as well as by those who do not operate until the

condition of the patient permits. Sellers and Sanders, and Echols had no mortality at all, yet the mortality of others who practice the same prompt operation is high. Fitzgerald and Brewer reporting the largest

TABLE II

	NO. OF CASES	DEATHS	PER CENT MORTALITY	PER CENT CORRECT
Baens[9]	174	15	8.6	68.0
Behney[10]	167	3	1.8	61.3
Willis[11]	104	4	3.8	62.0
Curran and Goodale[12]	108	6	4.6	–
Echols[13]	103	0	0.0	70-80
Fitzgerald and Brewer[14]	500	39	7.8	60.4
Gordon[15]	120	2	1.7	87.0
Hendry[16]	152	9	5.9	79.6
James and Lafferty[17]	103	3	2.91	74.0
Masson[18]	471	8	1.8	–
Meagher[19]	247	8	3.2	90.0
Ricci and DiPalma[20]	100	9	9.0	89.0
Sellers and Sanders[21]	211	0	0.0	75.0
Tyrone, Romano and Collins[22]	309	36	11.6	51.5
Urdan[23]	474	14	2.95	71.7
Total	3,343	156	4.6	

number of cases, including 91 patients in collapse, show approximately the same mortality for deferred and immediate operation, 33 to 34 per cent. Obviously there are other important factors—the preparation of the patient for operation, and the conduct of the operation itself.

DIAGNOSIS

It is clear that reduction of the mortality of ectopic gestations depends more upon early recognition than upon treatment. In most fatal cases symptoms were present for considerable time before operation was done. Either these symptoms were ignored by the patient or disregarded by the physician. Women should be warned of the possible significance of delayed menses and pain whether associated with vaginal bleeding or not.

It still is stated in textbooks and elsewhere that the diagnosis of ruptured ectopic pregnancies is especially difficult, whereas it should not be. The well-trained general practitioner usually makes the diagnosis, and often he is in an excellent position to do so since onset symptoms are characteristic but fleeting. The symptom complex and the physical signs are definite, and the diagnosis should be made as often as in acute appendicitis, where the physician feels that he should make few mistakes, although acute appendicitis may be just as atypical as ectopic gestation.

It is not necessary to discuss all the symptoms. That it is more common in multiparas and in women with a laporotomy scar is well known. Bleeding with unilateral pelvic soreness or pain, usually moderate, sudden but not dramatic, shoulder pain, syncope or momentary faint-

ness, dysuria, dyschesia, slight jaundice, chill, and vomiting occur typically with repeated remissions, and are often so slight that only close inquiry will develop them. A perfect history, keeping ectopic gestation in mind, with general survey of the patient before vaginal examination is made, will suggest diagnosis.

The absence of high temperature and the complete blood picture are very helpful not only in diagnosis but also in estimating the time of rupture; falling red cell count and hemoglobin, with leucocytosis beginning in an hour or two and reaching its maximum about ten hours after rupture,[24, 25] and returning slowly to normal does not always depend upon the amount of blood lost. Rigidity, often unilateral, is less marked than in acute appendicitis and salpingitis, and the presence of a small amount of intraperitoneal blood may be shown much more commonly than is supposed. Abdominal distention occurs typically below the umbilicus.

Vaginal examination, made last of course, may not be necessary or advisable. The pelvic mass is not essential, but it is important to remember that it grows, and that blood in the culdesac is far more tender than inflammatory exudate; pain on cervical motion is significant when acute. That negative findings on curettage are of little value has recently been emphasized by Teacher.[26]

TEXTBOOKS

Recent textbooks do not agree on the management of critical cases, although for the most part teachers are emphatically in favor of immediate operation. Anspach[27, 28] in his own book, as well as in the textbook edited by Curtis, says: "When the patient's condition is critical, operation must be consummated without delay. Advisability of immediate operation has been disputed in the past by a few gynecologists. The practical application of their theory was not successful," yet Curtis[29] himself says: "If the patient is in profound shock, temporary delay of intervention is usually advisable. . . . It is our custom to watch some of these patients rather than to operate."

Blair Bell[30] says: "Whichever course be pursued cases will be occasionally lost, but on the whole immediate operation holds out the best prospect for ultimate recovery. One has always to bear in mind that if the patient die in an acute case she does from hemorrhage, and that the proper surgical procedure is to find and arrest the bleeding. An operation, however, can rarely be performed within an hour or so of the primary crisis, and in that time it is usually obvious whether the patient is rallying or not. If not, no time should be lost in opening the abdomen. If the patient appears to be improving, and there be evidence of considerable intraperitoneal hemorrhage the surgeon should not leave her, but allow her to recover so far as possible and then operate within a few hours of the onset of the acute symptoms. If a sudden change occur denoting further bleeding during this period immediate operation can be performed."

Bland and Montgomery,[31] Brady,[32] Greenhill,[33] Comyns Berkeley,[34] J. Munro Kerr and others[35] say there is no expectant treatment, allowing only time enough to prepare for operation.

Crossen[36] advises immediate section if the patient is within reach of an experienced abdominal surgeon and can be placed in suitable surroundings, otherwise operation is best deferred. He says that "The marked emphasis which teachers and writers generally have placed upon promptness of operation has unfortunately led to considerable indiscriminate operating. These desperate cases where the vital forces are at a low ebb require much judgment and discrimination as to when to operate . . . on the one hand to stop the bleeding, and thus prevent the patient from passing into an absolutely hopeless condition, and on the other hand, to avoid snuffing out the little spark of life remaining by the added strain of intraperitoneal manipulation and anesthesia."

Goodall[37] says there is no fixed rule; but he advises immediate operation and transfusion as soon as ligation has been effected.

Litzenberg[38, 39] advises ligation as soon as the patient's condition will permit. "However," he says, "the patient is sometimes in such grave condition that to do an immediate laparotomy would be only inviting death." The advantage of transfusion just before operation has made him an advocate of immediate operation with rapid preparations under ideal conditions.

C. Jeff Miller[40] unqualifiedly in favor of immediate operation says that the late J. O. Polak was almost the only authority of consequence to advocate delayed operation.

Since the margin of reserve is so narrow in many of these cases, it is clear that support of the patient is of the utmost importance, no matter when operation is done, yet this phase of treatment often receives but scant attention, nor is the actual management of the operation agreed upon. The importance of transfusion, easily our most valuable asset, is not stressed as specific in the treatment of hemorrhage, nor do our teachers agree as to when it should be done, most authorities advising that it be carried out after operation, probably because they fear it will be lost in the abdomen or may cause recurrence of bleeding, yet when ready to operate is the logical time for it, whether the patient is bleeding actively or not.

Some remove the blood and clots in the abdomen, washing out with saline, while others remove only the clots. Autotransfusion is approved, although it is known to be dangerous and deaths have been reported from it. The best anesthetic for operation is still unknown. Whether diagnostic colpotomy should be practiced is highly doubtful. The value of hypodermoclysis and stimulation and intravenous gum salt solution and glucose should be studied; some have found acacia dangerous. The absolute importance of perfect technic should be stressed, and multiple operations, particularly appendectomy, condemned. Certainly sufficient time has elapsed to warrant definite recommendations.

COMMENT

All patients should be operated upon although some may get well otherwise. Whether intraperitoneal rupture is more common than tubal abortion, better called intratubal rupture, makes very little difference; some however try to differentiate because in one, hemorrhage usually

ceases with expulsion of the ovum; while in the other, hemorrhage may continue whether the ovum has wholly escaped or not. Intraperitoneal hemorrhage can arise anywhere in the tube, and the amount of blood lost does not depend solely upon the site of rupture.

The rule is repeated rupture. For practical purposes pain is peritoneal in origin, and pain means rupture. From the statistics of those who await reaction and since most patients have symptoms for a week or more, it is probably true that death but rarely quickly follows primary rupture. Even where death seems imminent it may often be averted by quick skillful operation, or by deferring operation until supportive treatment lessens the risk. Good results follow both methods of treatment, and it should be conceded that death may occur because of as well as in spite of treatment.

It is generally taught that death is almost invariably due to hemorrhage, or hemorrhage and shock, yet it has been shown that sepsis is an important factor. Shock and hemorrhage are different, yet Blalock[41] has shown that increased blood concentration, negative response to transfusion and marked alterations in the tissue can be produced by hemorrhage too. Certainly in ectopic hemorrhage and shock are for practical purposes synonymous.

Wiggers[42] says that more than half of the blood volume calculated at 8.8 per cent of body weight may be lost without immediate or subsequent fatal effects, thus showing the high margin of safety.

The mechanism of reaction is fairly well established—spleen and peripheral arterioles contract, and within a few hours plasma is increased by reabsorption from tissue spaces, the red cells and hemoglobin thus slowly decreasing. Blood volume may be increased greatly by use of concentrated intravenous glucose, yet it appears that if hemoglobin falls below 20 per cent, increase in blood plasma is without benefit. Low blood pressure due to diminished blood volume can be permanently raised by transfused blood which contributes oxygen carriers as well.

Cannon[43] says that a low pressure barely sustained or already low or only recently restored may be seriously reduced by operative procedures.

It is essential to ligate bleeding vessels, but it is not good judgment to interrupt compensatory reaction. Few patients can be operated upon within an hour or two of rupture. Either hemorrhage has stopped only to begin again, or it is still going on. Any treatment may be as dangerous as the condition itself. Fine judgment is necessary. It should be obvious that if most cases show reaction, the inexperienced occasional operator, at least, will lower his mortality by waiting for it. Why teach that immediate operation should be done no matter what the condition of the patient? Certain death without operation should be the only consideration compelling operation in poor surroundings with inex-

perienced assistants. Unqualified endorsement of immediate operation is unfortunate. The facts do not warrant it since excellent results have been obtained otherwise.

Individual experience and definite convictions may lead to misconceptions. There is no objection to continuing the practice of years if one is satisfied with his own results. Possibly it makes very little difference which plan of treatment is followed by those who operate quickly, fortifying the patient by transfusion. The surgeon and the general practitioner who so often operate themselves are an important part of the problem.

SUMMARY

The impression that the mortality of ectopic gestation is well under control is erroneous. Nearly 6 per cent of the maternal mortality of the City of New York is due to ectopic gestation; equally high figures, with a large percentage of deaths due to sepsis, and many patients never operated upon at all, are reported elsewhere. Even gynecologists have published inconsistent results. The outstanding fact is failure of diagnosis.

Our textbooks disagree on treatment and for the most part fail to emphasize and discuss thoroughly the importance and value of supportive treatment. It should be possible to rationalize teaching at least. It should not be said repeatedly that diagnosis is especially difficult, nor should it be unqualifiedly stated that every patient should be operated upon at once no matter what her condition, no matter who may be the operator.

In the presence of intraperitoneal blood only the simplest operative procedure should be carried out. It is perfectly proper and wise to defer operation in many serious cases, not indefinitely, but until transfusion and other supportive treatment lessen the risk of operation.

A comprehensive survey of the whole problem should be undertaken.

REFERENCES

(1) *Tait, Lawson:* Lectures on Ectopic Pregnancy and Pelvic Hematocele, Birmingham, 1888. (2) *Schauta, F.:* Beiträge zur Kasuistik, Prognose, und Therapie der Extrauterinschwangerschaft, Prague, J. G. Calvé, 1891. (3) *Robb, Hunter:* Am. J. Obst. **58:** 577, 1908. (4) *Robb, Hunter:* Tr. Am. Gynec. Soc. **32:** 373, 1907. (5) New York Acad. Med.: Maternal Mortality in New York City, 1930-32, Oxford University Press, London, 1933. (6) Committee on Maternal Welfare: Maternal Mortality in Philadelphia, 1931-33, Philadelphia County Medical Society, 1934. (7) Maternal Mortality in Fifteen States, United States Department of Labor, Children's Bureau Publication No. 223, Washington, 1934. (8) *Litzenberg, Jennings C.:* Davis, Gynecology and Obstetrics **1:** Hagerstown, 1934, W. F. Prior Co., Inc., chap. 11, p. 12. (9) *Baens, A.:* J. Philippine Islands M. A. **12:** 497, 1932. (10) *Behney, Charles A.:* J. A. M. A. **95:** 1557, 1930. (11) *Willis, Byrd Charles W.:* South. M. & S. **94:** 206, 1932. (12) *Curran, John F., and Goodale, Raymond H.:* New England J. Med. **209:** 189, 1933. (13) *Echols, Chester M.:* J. A. M. A. **103:** 1686, 1934. (14) *Fitzgerald, James E., and Brewer, John I.:* Am. J. Obst. & Gynec. **30:** 264, 1935. (15) *Gordon, Charles A.:* Am. J. Surg. **3:** 456, 1927. (16) *Hendry, W. B.:* Am. J. Obst. & Gynec. **10:** 386, 1925. (17) *James, John E., Jr., and Lafferty, Henry:* Am. J. Obst. & Gynec. **29:** 711, 1935. (18) *Masson,*

James C.: Minnesota Med. **13:** 822, 1930. (19) *Meagher, William C.:* Am. J. Obst. & Gynec. **29:** 541, 1935. (20) *Ricci, James V., and DiPalma, Salvatore:* Am. J. Obst. & Gynec. **22:** 857, 1931. (21) *Sellers, Thomas B., and Sanders, John T.:* Southern M. J. **21:** 283, 1928. (22) *Tyrone, C. H., Romano, S. A., and Collins, C. G.:* Am. J. Obst. & Gynec. **30:** 112, 1935. (23) *Urdan, Benjamin E.:* Am. J. Obst. & Gynec. **20:** 355, 1930. (24) *Perry Pepper, O. H., and Farley, David L.:* Practical Hematological Diagnosis, Philadelphia and London, 1933, W. B. Saunders & Co., p. 115. (25) *Kilduffe, Robert A.:* The Clinical Interpretation of Blood Examination, Philadelphia, 1931, Lea & Febiger, p. 243. (26) *Teacher, John H.:* A Manual of Obstetrical and Gynecological Pathology, London, 1935, Oxford University Press. (27) *Anspach, B. M.:* Curtis, Obstetrics and Gynecology **3:** Philadelphia, 1933, W. B. Saunders Co., p. 369. (28) *Anspach, B. M.:* Textbook of Gynecology, ed. 5, Philadelphia, 1934, J. B. Lippincott, p. 446. (29) *Curtis, Arthur H.:* A Textbook of Gynecology, ed. 2, Philadelphia, 1934, W. B. Saunders Co., p. 345. (30) *Blair-Bell, William:* The Principles of Gynaecology, ed. 4, Baltimore, Wm. Wood & Co., p. 353. (31) *Bland, P. Brooke, and Montgomery, Thaddeus L.:* Practical Obstetrics, ed. 2, Philadelphia, 1934, F. A. Davis Co., p. 296. (32) *Brady, Leo:* Lewis, Practice of Surgery **11:** Hagerstown, 1928, W. F. Prior Co., chap. 24, p. 24. (33) *Greenhill, J. P.:* The Practitioners Library of Medicine and Surgery **6:** New York and London, 1934, D. Appleton-Century Co., p. 291. (34) *Berkeley, Comyns:* Diseases of Women by Ten Teachers, 1934, Wm. Wood & Co., p. 468. (35) *Kerr, J. Munro, and others:* Combined Text Book of Obstetrics and Gynecology, ed. 2, Baltimore, 1933, Wm. Wood & Co., p. 258. (36) *Crossen, Harry S., and Robert J.:* Diseases of Women, ed. 7, St. Louis, 1930, The C. V. Mosby Co., p. 739. (37) *Goodall, James:* Davis, Obstetrics and Gynecology **2:** Hagerstown, 1934, W. F. Prior Co., Inc., chap. 14, p. 21. (38) *Litzenberg, Jennings C.:* Nelson Loose-Leaf Living Surgery **7:** New York, 1928, Thomas Nelson & Sons, p. 542. (39) *Litzenberg, Jennings C.:* Davis, Obstetrics and Gynecology **1:** Hagerstown, 1934, W. F. Prior Co., Inc., chap. 11, p. 11. (40) *Miller, C. Jeff:* Clinical Gynecology, 1932, St. Louis, The C. V. Mosby Co., p. 294. (41) *Blalock, Alfred:* Surg. Gynec. Obst. **58:** 551, 1934. (42) *Wiggers, Carl J.:* Physiology in Health and Disease, 1934, Philadelphia, Lea & Febiger, p. 311. (43) *Cannon, Walter B.:* Traumatic Shock, 1923, New York and London, D. Appleton-Century Co.

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DISCUSSION

DR. S. A. WOLFE, Brooklyn, N. Y.—Prevention of the high mortality rate in ectopic pregnancy lies largely in the effort to reduce the incidence of the critical type of case. In the Long Island College Hospital over an eleven-year period, the mortality was 5.4 per cent in a series of 149 cases. When these figures were analyzed more closely there were 3 deaths in 19 critical cases, or 15.2 per cent, whereas there were only 5 deaths in 123 of the noncritical type, or 4.05 per cent.

There are four main clinical types in which this disease appears. In the first group the history and physical findings are classical. After a period of amenorrhea, recurring attacks of pain in the lower abdomen and bleeding, tender pelvic mass, tender cervix, typical blood count, afford early diagnosis and therefore early operation, generally without mortality.

In the second group of cases, the history is oftentimes misleading. Menstruation occurs at the expected time and continues. Pain appears simultaneously or several weeks later. These patients are very frequently treated for a supposed salpingitis and pelvic peritonitis. Diagnostic difficulties can be eliminated by close attention to the history. Ascending salpingitis with peritonitis beginning after menstruation usually appears within a week after the end of the last menstrual period. In this puzzling group of ectopic gestation with atypical history and pelvic mass, posterior colpotomy should be stressed. It is safe and gives prompt diagnosis.

In the third group of ectopic patients the history is classical as in Group I, or somewhat atypical as in Group II, but the physical findings are misleading. Repeated intraperitoneal bleeding has produced large hematoceles either in the

pelvic or abdominal cavities. Such masses are often mistaken for ovarian cysts and occasionally for fibroids. Since there is no delay in operation, error in diagnosis does not jeopardize the patient.

In the last group of ectopic pregnancies the clinical picture is always critical. Amenorrhea has persisted for several weeks or even several months. There is abrupt pain followed by collapse. Diagnosis is easy but treatment requires careful judgment.

A conservative plan was formulated by the late Dr. John O. Polak in the preparation of the critical case for operation. The Trendelenburg position was employed and external heat, morphine and hypodermoclysis were administered. When the systolic pressure returned to 100 mm. of mercury and the pulse had fallen to about 100, operation was begun. The donor, matched in the interim, was ready for the transfusion as soon as the mesosalpinx was secured.

It is possible that patients may die from shock and hemorrhage under this expectant regime, for the isthmic segment of the tube contains large arteries and veins which may continue to bleed in spite of the low blood pressure, morphine, and rest. A fatal outcome can be avoided by limiting the period of expectant observation to one hour. Nothing is lost for in this interval operating room and donor are made ready. If the patient is improving at the end of the stated hour the Polak technic is followed; while if there is no improvement as judged by continued low blood pressure and rapid pulse rate, operation follows. Transfusion under these circumstances should begin with the abdominal incision for little blood will be lost from the gaping vessels with the blood pressure so low. A second transfusion may be given later if necessary.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—Thirty years ago after a death from the abdominal operation for ectopic pregnancy, I decided that an important factor was the added shock due to peritoneal exposure and traumatism. As a result, for the last thirty years I have operated in all of these tragic cases by the vaginal route. It is a simple operation. The cervix is pulled down and forward by a tenaculum forceps, a puncture made by curved scissors through the culdesac, two fingers inserted and the opening enlarged by traction. The large fallopian tube is located by the fingers and drawn down into the vagina. Sometimes adhesions prevent this being done easily, when ring forceps may be introduced, the tube grasped and pulled down as the adhesions are brushed aside. If the patient is pulseless a clamp is put on the tube proximal to the enlargement, a gauze drain introduced into the culdesac and the patient returned to bed. The blood escapes spontaneously from the peritoneal cavity without sponging or irrigation. In most cases the patient is not in such critical condition and a few minutes more may be used while a ligature is tied around the tube and the enlarged portion cut away.

In no case is the operation to be delayed. Why should one delay when by such a simple procedure the bleeding may be positively arrested within five minutes? To one familiar with the technic of vaginal section the operation requires little more time than that for an exploratory puncture into the culdesac. The only death which has followed this operation in our hands was due to pneumonia and occurred three weeks after the vaginal section.

DR. NATHAN P. SEARS, SYRACUSE, N. Y.—The first point I wish to emphasize is that if we can train our students to be careful and to keep in mind ectopic pregnancy whenever irregular bleeding and pelvic pain are present, is that many cases of ectopic gestation will be recognized before they become tragic. When I see a patient with the complaint of some recent or sudden changes in menstruation with or without pain and I can elicit tenderness or a mass in one side of the pelvis, I immediately send her to the hospital and keep her under observation until I can

be sure whether we are dealing with an ectopic gestation, normal pregnancy, corpus luteum cyst, or other pathology. Gentle examination may be necessary under anesthesia. I believe a careful and experienced gynecologist can do less harm with the patient anesthetized than otherwise. On several occasions it has been impossible for me to finally make a diagnosis and in several instances I have made a short midline incision, briefly inspected the tubes, and if an ectopic gestation was not found, have closed the abdomen with interrupted sutures and allowed the patient to go home within a week.

DR. A. K. PAINE, BOSTON, MASS.—I would like to reemphasize the value of posterior colpotomy, especially in the differential diagnosis between early incomplete miscarriage and the slowly developing tubal abortion. After curetting a presumable early miscarriage, in which the material removed was not sufficient to make an obvious diagnosis and the possibility of tubal abortion having been considered, the posterior culdesac is opened and if necessary laparotomy can follow immediately. If the posterior colpotomy rules out the possibility of a tubal pregnancy, its use does not delay the convalescence necessary for the curetting alone.

DR. JAMES R. MILLER, HARTFORD, CONN.—In reporting maternal mortality in Hartford for twenty years, ending 1928, I attempted to make an estimate of the mortality from ectopic pregnancy, and came to the conclusion that the death rate of ectopic gestation was 4.8 per cent. Since then I have found that this estimate was too low and that it probably should have been 6 per cent or even higher.

A review of seven years subsequent to that time, in which I was able to count all of the ectopic gestation done in our local hospitals, showed 6 deaths in 205 cases, giving a mortality of slightly less than 3 per cent, so that I think in our community we have made some progress.

As regards colpotomy for diagnosis, we should always keep in mind the possibility of having sepsis as well as ectopic gestation present.

DR. FREDERICK H. FALLS, CHICAGO, ILL.—In certain of the tragic cases mentioned, the anesthesia may also add to the shock, and for that reason recently I have been using local instead of general anesthesia for most of these cases of tragic ectopic gestation. I have also felt that the vaginal route causes much less shock than the abdominal, and therefore I have operated under local anesthesia through the vagina. Instead of opening posteriorly as Dr. Babcock suggested, I have opened anteriorly in those cases in which the uterus seemed to be anterior, and posteriorly where the uterus seemed to be posterior.

DR. W. A. SCOTT, TORONTO, CANADA.—Posterior colpotomy has been carried out almost routinely at our clinic for a number of years. On a previous occasion when I mentioned the value of posterior colpotomy, it was questioned by some members and the argument brought against it was the possibility of introducing sepsis. During the last two years we have adopted in these doubtful cases of posterior colpotomy as a routine, simply using a large needle. It is done without an anesthetic, with practically no pain, in an examining room, and we have found that it is eminently satisfactory in those cases where there is much blood.

DR. L. A. CALKINS, KANSAS CITY, MO.—I have found that a great many operators in handling ectopic pregnancy will transfuse the patient either before or after operation and feel that they have done a good and sufficient job. I know of two patients within the past year who have died because they had only one transfusion when undoubtedly two or three transfusions would have produced a different result. I think that in our teaching the value of sufficient blood should be emphasized—not just "a transfusion."

DR. F. S. WETHERELL, SYRACUSE, N. Y.—The use of the sphygmomanometer in these cases must be stressed. Recently a patient was brought to the hospital and the surgeon said, "We will wait because Polak has advised waiting." The systolic pressure of the patient was 80. It came back to 120 at eight o'clock in the evening. At twelve o'clock the interne notified the surgeon that the blood pressure was now 60 systolic. A half hour later the patient was dead. Repeated blood pressure recordings, quarter hourly, should therefore be the rule.

Operation, plus transfusion, *as the blood pressure approaches normal,* will lower death rate in ectopic pregnancy. The surgeon, whether he operates by the vaginal or the abdominal route, who takes longer than ten or fifteen minutes to perform the operation, will lose patients who can be saved. Stopping to fondle the internal organs, and often to take out blood clots, suck out blood and the like, is not good surgery.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—There is a silent symptom group the frequency of which should be better known. If the pathologist will split the tube from the proximal to the distal end and then wash out anything from the lumen with hot water, he will be able to select the proper area for section and make a diagnosis in some of these silent cases. Otherwise they will not get into the statistics at all.

DR. GORDON (closing).—I had thought that my paper was the paper of an heretic, but in the discussion no one has taken issue with me on the point that immediate operation is not to be advised. Personally I do not believe in posterior colpotomy nor in examination under anesthesia. We all disagree on these minor things, and yet I have shown that the mortality in the last thirty-five or forty years is no different from that reported by Schauta. Investigation should show whether we should wash out the blood or leave it in, and whether to give salt or gum acacia, and whether to transfuse or not.

INTRASPINAL ALCOHOL INJECTIONS AND SYMPATHECTOMY FOR PAIN ASSOCIATED WITH CARCINOMA OF THE CERVIX*

A COMPARISON IN EIGHTY CASES

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(From the Loyola University Medical School and the Cook County Hospital)

EACH year we see a large number of women with advanced carcinoma of the cervix, and notwithstanding the thoroughness of any form of treatment, about four out every five of these women die of the disease. Practically all of the women with Group III and Group IV carcinoma of the cervix develop severe pain in the lower abdomen, lower back, or down the legs. The pain is due to involvement of the sensory nerves in the malignant process, and at present there are three means of combating this pain other than direct treatment of the malignancy. The

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first consists of the use of derivatives of opium, chiefly morphine, and is the method employed almost universally by most physicians. However, morphine is not entirely satisfactory because as the patient's tolerance for the drug increases, larger doses must be given; some women cannot take the drug because it produces nausea and vomiting, others become morphine addicts and are difficult to handle, and the drug becomes increasingly more expensive for poor patients. The second method is surgical and consists of pelvic sympathectomy and chordotomy. While the former operation is relatively simple, it requires an abdominal operation and, as we shall show, it does not relieve all patients. Chordotomy is a serious operation which must be carried out by a skillful neurosurgeon. The third means of overcoming the pain due to a malignant growth consists of blocking the nerves which conduct the sensation of pain by means of various solutions. We have used alcohol for this purpose and have injected it into the spinal column.

In two previous publications[1, 3] we discussed the physiology of pain and the theoretic reasons for the successful results obtained by means of pelvic sympathectomy and subarachnoid injection of alcohol. We explained that since the nerve fibers of the superior hypogastric plexus are sensory and not motor, resection of the superior hypogastric plexus above the hypogastric ganglion will relieve most if not all the pain which arises in the pelvic organs. Subarachnoid alcohol injections are effective in relieving pain because they injure the peripheral nerve fibers in the posterior or sensory roots. We advised that the patient be placed on her side, with her hips elevated and turned somewhat ventrally. We suggested this posture in order to try to bring the anterior or motor roots out of reach of the alcohol which floats in the cerebrospinal fluid since its specific gravity is less than that of the spinal fluid. Since with one exception, which will be described in detail, we have encountered no pronounced motor disturbances following the alcohol injections, this posture may explain the absence of injury to the motor roots. This may be the proper explanation for the success of the cases when the injections were made in the first lumbar interspace, but it cannot explain the relief of pain when the injections are made in the fourth lumbar interspace. In the latter region we encounter the cauda equina where both motor and sensory fibers are close together. We know that sensory nerves and particularly the pain fibers are more susceptible to the effects of alcohol than motor roots. Hence in the cauda equina only the sensory nerves are affected by the alcohol. The greater susceptibility of the pain and other sensory nerves to the effects of alcohol may be explained by the diminished amount of myelinization which these nerve fibers possess. It is also probable that even in the first lumbar interspace the motor roots are reached by the alcohol but are not affected because of their heavier myelinization and lessened susceptibility.

TECHNIC OF PELVIC SYMPATHECTOMY

Since many patients who should be subjected to this type of operation are poor surgical risks it is best to open the abdomen under direct infiltration anesthesia. This is a very simple procedure and requires only a few minutes. The rest of the operation may readily be performed under a short ethylene or ether anesthesia or even under infiltration anesthesia. The patient should be placed in the Trendelenburg position after a midline incision has been made from the umbilicus downward toward the pubis for about 10 to 12 cm. After the peritoneal cavity is opened the small intestines are packed off and the sigmoid and rectum are pushed to the left side and held there with a wide retractor. The uterus, adnexa, and bladder may then readily be inspected and palpated to determine the extent of the malignant infiltration. We may also detect a complication such as pus tubes which can be remedied by a surgical procedure. The region of the lower two lumbar vertebras and the upper part of the sacrum is exposed to view. In thin women, it is possible in some cases to see the presacral nerve immediately beneath the peritoneum. Whether or not the nerve is seen, the parietal peritoneum above and in the middle of the sacral promontory is elevated and incised with scissors. This incision is extended upward for about 4 or 5 cm. and for a similar distance down along the sacrum. When the peritoneal flaps are pulled aside, a fibrocellular connective tissue layer will be exposed covered by more or less adipose tissue. This tissue can easily be separated from the peritoneum and the lower end of the aorta without danger. It is in this layer that the presacral nerve lies. With an aneurysm needle the tissue is elevated at the bifurcation of the aorta and the dissection is carried to a still higher level. As this is done it will be found that in most instances the tissue spreads out in a triangular manner. The middle sacral artery should be pushed away from the nerve, but if it is injured, it can readily be ligated. After the dissection is carried as high as it is desirable to go, the layer of nerve tissue is separated from the underlying tissue down past the sacral promontory into the pelvic cavity. In this region the plexus has divided into the two hypogastric nerves, hence it is necessary to dissect one of these nerves at a time. At least 2 or 3 cm. of each hypogastric nerve should be resected in addition to four or more centimeters of the superior hypogastric and the intermesenteric plexuses. The fibrous tissue layer which contains the hypogastric nerves is much more resistant than that which contains the presacral nerve. As the dissection is carried out, nerve filaments projecting outward will be encountered. These should be followed as far laterally as possible before cutting them. In most instances ganglia will be included in the resection. The dissected tissue should preferably be removed in one piece. It is not necessary or advisable to ligate the presacral nerve or the hypogastric nerves before cutting them, because the only blood vessels in intimate contact with them are insignificant vasa nervosum. In fact Cotte is of the opinion that ligatures may be the origin of secondary pains. Very rarely is bleeding encountered which requires more than simple temporary pressure to check it. (Where the mesosigmoid is very short, care must be exercised to avoid injury to the inferior mesenteric vessels.) After the nerve is resected, the posterior parietal peritoneum is sutured with plain catgut and the abdominal wall is closed in the customary way. Since women with inoperable carcinoma are usually cachectic and prone to exhibit poor wound healing, it is advisable to use silkworm gut or other permanent suture material to aid in the closure of the abdominal wall.

TECHNIC OF INTRASPINAL (SUBARACHNOID) INJECTION OF ALCOHOL

No preliminary medication is given since we wish to observe the immediate effects of the injection. Most patients with advanced carcinoma of the cervix and other genital organs have much more pain on one side than on the other. The patient is placed on the side opposite to that where most of the pain is present. A pillow or pad is placed under her pelvis and side to elevate the sacral and lumbar

portions of the spine, her back is arched as much as possible, her body turned somewhat ventrally and the head lowered slightly. By placing the patient in this attitude, we raise the sacrolumbar region of the spine to the highest level and at the same time make the posterior or sensory nerve roots lie horizontally. The anterior or motor nerve roots come to lie in a plane which is usually out of reach of the alcohol. Even if the motor nerves are not removed from the field of the alcohol, as occurs in the cauda equina, they are not often affected because sensory nerves are more susceptible than motor fibers to the effects of alcohol.

Some one should hold the patient in the proper position. A weak solution of iodine or other antiseptic is applied over the lumbar and upper sacral regions. In most of our early cases the fourth lumbar interspace was selected for the injection of the alcohol. We made many injections in the first, second, and third lumbar interspaces to see if we could relieve the pain which some women develop high up in the abdomen and back. Since this could not be accomplished in all cases and since the high injections sometimes failed to relieve all the pain in the lower abdomen and back, we are now again making all our injections in the fourth lumbar interspace. An ordinary lumbar puncture needle with a stylet is used. The needle is injected into the desired interspace just as for an ordinary lumbar puncture, and we prefer not to use novocaine in the skin before inserting the needle. After the needle is in the subarachnoid space, as evidenced by the flow of spinal fluid, 0.5 c.c. of absolute or 95 per cent alcohol is injected into the cerebrospinal fluid. For this purpose it is best to use a tuberculin syringe so as to be sure not more than 0.5 c.c. is injected. Furthermore, the alcohol must be injected very slowly, drop by drop, taking about two minutes for the injection of the 0.5 c.c. This will avoid a mixture of the alcohol with the spinal fluid. The alcohol rises immediately to surround the posterior roots because the specific gravity of alcohol is about 0.806, whereas that of the spinal fluid is 1.007. No attempt should be made to draw spinal fluid into the syringe to mix it with the alcohol because this is exactly what is *not* wanted. After the injection is made, the needle is withdrawn and the puncture hole covered with sterile gauze and adhesive. Before the injection is completed, the patient will complain that the upper leg feels numb or hot and that she cannot move the leg. The numbness is almost routinely experienced after the injection but disappears spontaneously after a few hours or few days in most of the cases. In spite of what the patient says concerning her inability to move the leg, she can easily move it when requested to do so. At the same time that the patient informs us of the numbness she also often tells us either voluntarily or in answer to our query that her pain has disappeared. The longer the patient is permitted to lie on her side, the better the results. Hence we now keep our patients on their side for two hours after the injection. Then these women are permitted to get up and walk around. Some find difficulty in getting up from a chair because their "leg is asleep." Sometimes the leg feels heavy and the patient experiences some trouble in walking up steps because the knee flexes readily. These sensations usually wear off in a few hours although in some women they last a number of weeks. Nearly all of our patients who were ambulatory went home within three hours after the injection, and no ill effects have been observed from this procedure. It is perhaps best, however, to keep the patient in a hospital for twenty-four hours.

If the patient has pain on both sides, an injection is made a week later with the patient lying on the opposite side. The same amount of alcohol is injected.

Until a few months ago we restricted the subarachnoid injection of alcohol to patients with hopelessly advanced cancer. We did this because we feared the effects of absolute and 95 per cent alcohol on the spinal cord. Since we have thus far not observed any bad effects from the injections, we injected alcohol intraspinally in six women who had severe pruritis vulvae and/or pruritis ani and obtained striking relief, thus far up to four months. To accomplish this we have slightly modified our technic.

ANALYSIS OF RESULTS

In this paper we have attempted to analyze our results with both sympathectomy and alcohol injections. For this purpose we selected our first 40 sympathectomies and our first 40 alcohol injections. All of the 80 women had Group III or Group IV carcinoma of the cervix when they first came under observation.

PELVIC SYMPATHECTOMY

All of the 40 women who had a sympathectomy had Group IV carcinoma. Fifteen (37.5 per cent) obtained complete relief, 14 (35 per cent) were partially relieved, and 11 (27.5 per cent) were not relieved at all by the sympathectomy. Of the 15 women who were completely relieved of their pain, the relief has lasted from two to twelve months. Two of these 15 women are alive twelve months after the operation and are still free from pain. Among the 14 patients who were partially relieved, the pain was absent in some women for a period varying from one to five months after the sympathectomy, and then there was a recurrence of the pain. In other women we considered the result a partial success because only certain types of their pain were relieved but not all.

During the early months of experimentation with pelvic sympathectomy, we chose the patients most sick, and we did not discriminate between the various types of pain. We soon learned from our failures that sympathectomy could not be used to relieve all types of pain associated with carcinoma of the cervix. We found that the women who could be relieved promptly and perhaps for the duration of their lives were those who have pain in the middle of the lower abdomen, pain low in the back, rectal tenesmus, bladder pain and pain associated with vesicovaginal and rectovaginal fistulas. The women who cannot be helped much by sympathectomy are those who have pain in the sacrum due to fixation of the parametrium, pain referred from the region of the sacroiliac joint into the thigh posteriorly and laterally, pain down the anterior surface of the thigh due to involvement of the glands in the obturator canal and pain due to hydronephrosis and hydroureter. If we perform a sympathectomy on all women whose pain is due to carcinoma of the cervix, we cannot give complete or partial relief to more than half of them.

In this series of 40 sympathectomies there were 6 deaths within thirty days after the operation. However, 4 of the 6 women were relieved of their pain by the operation. Three of the patients were among the first few to be operated upon and were in critical condition at the time of operation. They died of the cachexia associated with their cancer. Of the remaining 3 deaths 1 was due to an ascending pyelonephritis (autopsy), 1 was due to embolism on the eighth day, and the third to a partial evisceration on the tenth day. (In our series of pelvic sympathectomies performed for severe dysmenorrhea, we have had no deaths.)

ALCOHOL INJECTIONS

Of the 40 women who received intraspinal alcohol injections 37 had Group IV and 3 had Group III carcinoma of the cervix. Thirty-four (85 per cent) of the women experienced complete relief, 2 (5 per cent) had partial relief, and 4 (10 per cent) had no relief from the injection.

In the patients completely relieved, pain has not recurred even after eight and a half months following the injection. Of the 2 women who received partial benefit from the injection 1 was completely relieved of the pain she had in the lower abdomen and right leg but her backache persisted. The other patient experienced complete

relief from pain for eighteen days after the injection, and then developed pain in the left kidney region. The latter type of pain cannot be relieved by intraspinal alcohol injections in the lumbar region.

Among the 4 failures 1 patient had had a sympathectomy before the alcohol injection with no relief. Another failure early in our series taught us to avoid more than 0.5 c.c. of alcohol for our injections. This patient had had a pelvic sympathectomy from which she obtained relief for six weeks. Then the pains returned. She was given an intraspinal injection of 1 c.c. of alcohol and another cubic centimeter on the opposite side two days later, but experienced no relief. For three days following the second injection she had urinary retention and for three weeks she had complete loss of power and anesthesia in the left leg. She died eleven weeks after the second injection and autopsy revealed the cause for the failure of the alcohol injections. The patient had bilateral hydronephrosis and the pain due to this could not have been relieved by our alcohol injections. The paralysis and anesthesia which this patient developed were the only serious complications observed in our entire series. We believe it was due to the excessive amount of alcohol injected and to the short interval between the two injections. Since this experience, except for four injections where we used 0.75 c.c., we have injected only 0.5 c.c. of alcohol. We have encountered a few other minor disturbances after alcohol injections. These are numbness of the leg for a few days, urinary retention or incontinence for a few days and diarrhea. We have not observed any motor disturbances except in the one patient who received the excessive amount of alcohol.

At the time of injection our patients had many complications such as "frozen pelvis," pelvic masses, invasion of the inguinal glands, rectovaginal and vesicovaginal fistulas and invasion of the bladder, the rectum and the labia.

Two of our patients received injections on both sides and one patient was given an injection in the first lumbar interspace after the injection in the fourth interspace had failed to give complete relief. The average age of our patients was slightly over forty-three years which is a tragic fact when we consider that practically all of these women had hopeless cancers.

COMMENT

A comparison of the series of patients treated by pelvic sympathectomy and the patients treated by alcohol injections demonstrates conclusively that better results are obtained by means of intraspinal alcohol injections. In addition to the greater incidence of relief obtained by means of the alcohol injections this procedure is far simpler than sympathectomy.

Just as continued experience with sympathectomy toned down our enthusiasm for this operation and taught us that not all patients with advanced cancer of the cervix can be relieved by pelvic sympathectomy, so we have come to learn from our experience with intraspinal alcohol injections that some women will not be benefited by these injections. We have found that we can relieve practically all pain associated with carcinoma of the cervix except that which is due to involvement of the upper urinary tract in the form of hydroureter and hydronephrosis. This complication produces pain not only high up in the kidney region but also severe discomfort in the parametrium on the affected side. We have not been able to stop this pain by intraspinal injections in the

lumbar region. Whether injections made higher up (in the thoracic region) can do this, we are not prepared to say because we have not tried this as yet.

We have long been of the opinion that every woman who has a Group III or Group IV carcinoma of the cervix should have either a retrograde or an intravenous pyelogram. Experience with the failures in our cases of alcohol injection has strengthened this opinion still more. Surely all women with advanced carcinoma who have severe pain in the pelvis should have a pyelogram.

Pain in the pelvis in cases of cervical carcinoma is due to one of the following three causes in the order named, (1) pyometra, (2) invasion or obstruction of the urinary tract, and (3) extension into the parametrium. The pain due to pyometra can readily be relieved by dilatation of the cervix to permit drainage of the uterine cavity. Pain due to invasion of the bladder with or without fistula formation can be relieved by either pelvic sympathectomy or alcohol injection. However, obstruction or invasion of the ureter with hydroureter and hydronephrosis cannot be relieved except by nephrectomy. Pain due to extension into the parametrium with fixation can be relieved by alcohol injection but not by sympathectomy. Very late in the disease, if the patients live long enough, pain is felt high up in the abdomen. This is due to extension of the disease above the sacrum into the aortic and iliac glands, into the liver and elsewhere. This type of pain cannot be relieved by either sympathectomy or alcohol injections in the lumbar region.

It is a good policy to inject alcohol intraspinally in all patients who have severe pain associated with carcinoma of the cervix, because even in women who have a hydronephrosis and other sources of pain we can relieve some of the pain. Nearly all of these women have pain not only due to the hydronephrosis but also due to extension of the carcinoma in various parts of the pelvis and the latter pains can readily be relieved by the alcohol injections.

When a pyelogram reveals the presence of a marked hydroureter and hydronephrosis in women with pelvic pain, we can determine whether the hydroureter is the cause of the pain in the parametrium by dilating the ureter and leaving a catheter in the ureter for twenty-four hours. If the pain is relieved by the ureteral catheter, the most likely cause of the pain is the stricture of the ureter and the hydronephrosis. If the patient is in fairly good physical condition, a nephrectomy should be done. If, however, the pain in the parametrium persists in spite of the ureteral dilatation and indwelling catheter, the pain is most likely not due to a ureteral stricture and hydronephrosis, and the patient can be promised relief from nearly all her pain by means of an intraspinal alcohol injection.

As time goes on, some of the patients who have thus far experienced complete relief from the alcohol injections will undoubtedly have a recur-

rence of pain, but higher up and due to stricture of the ureter with hydroureter and hydronephrosis as a result of the growth of the cancer. They will then develop a new type of pain which thus far we have been able to relieve only by nephrectomy.

SUMMARY

During the last few years we have been interested in methods of relieving the severe pain which is associated with carcinoma of the female genitalia, especially of the cervix. We began with pelvic sympathectomy which at first seemed to give spectacular results but later proved to be less satisfactory. We performed a pelvic sympathectomy upon all patients with advanced carcinoma who had severe pain, and we observed complete relief from pain in 37.5 per cent of our first forty cases, partial relief in 35 per cent and failures in 27.5 per cent. However, when we selected only those patients who had pain in the middle of the lower abdomen, pain low in the back, rectal tenesmus, bladder pain and pain associated with vesicovaginal and rectovaginal fistulas, we relieved practically all of them completely.

More recently we have resorted to intraspinal injections of alcohol to relieve the pain associated with Group III and especially Group IV carcinoma of the cervix. Among our first forty patients taken at random we have been able to obtain complete relief in 85 per cent, partial relief in 5 per cent and no beneficial effect in 10 per cent. In some cases relief has lasted for eight and a half months. The only patients not suitable for intraspinal alcohol injections (at least in the lumbar region) are those who have pain not only in the kidney region but also in the parametrium due to stricture of the ureter associated with hydroureter and hydronephrosis.

We believe that intraspinal injection of alcohol is preferable to sympathectomy not only because it is much simpler and can be performed by any qualified physician familiar with the essential features of this procedure but also because it may be used in a greater number of cases, and it gives relief to a larger percentage of women with advanced carcinoma of the cervix.

REFERENCES

(1) *Greenhill, J. P., and Schmitz, Herbert E.:* J. A. M. A. **101:** 26, 1933. (2) *Greenhill, J. P.:* Am. Med. **40:** 290, 1934. (3) *Greenhill, J. P., and Schmitz, Herbert E.:* J. A. M. A. **105:** 406, 1935.

55 E. WASHINGTON STREET

25 E. WASHINGTON STREET

DISCUSSION

DR. HENRY SCHMITZ, CHICAGO, ILL.—Relief from intractable pain in cancer of the female pelvic organ is very important since all sufferers from cancer who delay diagnosis and do not receive adequate treatment will finally reach the pain stage. The choice of method of treatment of pain depends on the extent of the disease and on the cause of the pain.

Clinical Group III cases become painful when stenosis of the cervical canal ensues, blocking the secretions within the uterine cavity. It results from the tumor or from contraction of the canal after intracervical and intrauterine radium insertions. Dilatation of the canal and insertion of a soft rubber tube T-drain relieve the intermittent pain from hydro- or pyometra permanently.

Clinical Group IV cases are characterized (a) by a frozen pelvis; (b) by an invasion of the vaginal mucosa, the vesicovaginal septum and vesical mucosa, the rectovaginal septum and rectal mucosa; (c) by distant metastases.

The frozen pelvis may compress the ureters and the parietal and visceral pelvic nerves. Compression of a ureter leads to retention of urine in the corresponding ureter and kidney. This causes flank pain which may radiate down into the inguinal canal and the inner aspect of the thigh. It is relieved by dilatation of the ureter and indwelling catheter. If it persists and the cancer has become arrested then ureteral transplantation into the colon, or, with extensive kidney damage, roentgen ray destruction of the kidney epithelium or nephrectomy should be considered. However, major operations should be avoided if possible on account of the poor general condition of such patients.

Invasion or compression of the parietal and visceral pelvic nerves causes excruciating backache, deep buttocks pain radiating down the outer aspect of the thigh along the sciatic nerve, or deep pelvic pain radiating to the perineum along the perineal nerve. Invasion of the bladder, the urethra and the rectum causes functional disturbances and painful function in these organs.

The sensory nerve fibers from the sympathetic presacral ganglia or the somatic sensory nerve fibers arising from the anterior horn of the cord are involved. Presacral sympathectomy stops the pain derived from this ganglion, and intraspinal alcohol injections arrest the pain originating in the sensory nerve fibers from the cord.

The conclusions of the essayists to use alcohol injections by preference are sound, as many patients are relieved for a long time. The motor disturbances result from a concomitant action of the alcohol on the adjacent motor fibers. However, these nerves recover almost invariably if the action of the alcohol is controlled by a proper position of the patient, as shown recently by animal experimentation in cats by Nafziger et al.

However, many patients may be relieved by a roentgen ray treatment applied to the midpelvis, of a 600 ϒ dose with 200 KV. This is a safe dose.

Should alcohol injections and roentgen treatment not help, then presacral sympathectomy should be considered.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—Three years ago when I presented a paper before this Society, Dr. Greenhill said that he saw no reason for advising such a formidable operation as a presacral sympathectomy for some of the conditions for which I advocated this treatment. Today he says it is very simple. I have now come to the conclusion that at times it is very formidable, particularly in carcinoma where the glands are firmly adherent to the aorta and the common iliac arteries.

Regarding alcoholic injections, it should be borne in mind that after the injection the patient should be leaning forward so that the sensory fibers are uppermost as far as possible, thus allowing the alcohol to float upward, preventing action on the motor fibers.

In evaluating the freedom from symptoms after the injection, the possibility that the patient may be a morphine addict must be kept in mind.

Of course, chordotomy is often the method of choice because it does eliminate, if the proper tract is cut, many of the complications we find with either alcohol injections or presacral neurectomy. I would advise that the detailed technic be carefully

studied before the alcohol injection is given. I believe alcohol injection will supersede resection of the superior hypogastric plexus in carcinoma cases.

DR. JAMES E. KING, BUFFALO, N. Y.—Up until about a year ago we treated the pain in cases of cervical carcinoma with morphine. I was at first somewhat opposed to alcohol injection, not because I did not believe that the alcohol if it reached the right place would correct the pain, but it seemed to me a serious procedure which might do a great deal of harm. However, the result of the first attempt was so satisfactory that we have during the last year used it in about twelve cases.

I do not see how confusion can occur between the pain that a patient experiences from hydronephrosis, and that which is due to nerve pressure. The question is rather easily settled, especially when the pain is marked. Alcohol injection has been used only in the cases where the pain was definitely pelvic. Eight of these cases have been very successful.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—The technic of alcohol injection may not be quite as simple for every one as it is in the hands of those who are unusually expert. With a very stout patient, it may be necessary to introduce the needle a distance of three or more inches before it reaches the spinal canal. In such a case particularly, it is difficult for me to tell just where the needle will hit the dura. The dura may be entered on the left side, the right side or in the midline. If one enters at the dependent side of the cord, the nerve roots opposite those it intended to block may first be affected. Again, one does not always know to what depth the point of the needle has entered the spinal canal; as the distance between the anterior and posterior roots is not great, the needle may pass beyond the posterior roots and deposit the alcohol about the anterior roots. Thus for accurate localization we must depend largely upon gravity as influenced by the position of the patient. Despite these possible errors, however, we must concede that the results reported have been surprisingly good.

It is evident that the concentration and dose of alcohol used is very important. From an injection of 1 c.c. I obtained a persistent motor weakness of the leg. While the patient had relief from pain, she would not permit an injection on the other side for fear she would not be able to walk.

In general, the anterior roots seem to be very much more resistant to the action of drugs than the posterior ones. For the posterior roots of a dog, a novocaine solution of the strength of 0.5 per cent suffices to produce a sensory block; for the anterior roots five times this concentration is required in order to produce a motor block. Thus it may be possible to use larger quantities of weaker solutions of alcohol, perhaps even about the cervical cord, and have motion preserved, although sensation is lost. The lower percentages of alcohol seem to be quite safe. In our clinic we have probably given for spinal anesthesia over 35,000 injections of anesthetic solutions containing from 10 to 13 per cent of ethyl alcohol, and in no case have we seen any paralysis or sensory loss from such use of alcohol. From injections of solution contaminated with 10 per cent of methyl alcohol, two patients had rather prolonged retention of urine, and a persistent weakness of the sphincters. One patient also had weakness of the perineal muscles.

The immunity of the anterior roots when only ½ c.c. of ethyl alcohol is injected, we would attribute to the early dilution of these few drops of alcohol. It is difficult to believe that if this alcohol reached the anterior roots in concentrated form there would not have been an occasional motor loss.

DR. NATHAN P. SEARS, SYRACUSE, N. Y.—Dr. Greenhill mentioned the fact that in constricted ureters with hydronephrosis resulting, nephrectomy might be indicated. I would think that if all the indications for a nephrectomy were present

it might be possible to destroy the remaining portion of the kidney on that side with roentgen therapy. Several years ago I presented the results of some work on destruction of kidney substance with the roentgen ray.

DR. GREENHILL (closing).—My differences in opinion with Dr. Wetherell can easily be explained. I said that sympathectomy was a relatively simple operation for advanced carcinoma of the cervix. When we consider that patients with an advanced carcinoma are in a hopeless state, sympathectomy is not a serious operation. However, when a laparotomy is performed for a condition which is not serious, such as dysmenorrhea, then surgical procedures are formidable, especially when the condition can be treated by nonsurgical measures.

Experiments on cats and dogs have shown that injection of alcohol in proper dosage is not injurious to the spinal cord. Dr. Babcock has shown that drugs other than alcohol affect the sensory nerves more than the motor nerves. Undoubtedly diminished myelinization of the sensory roots accounts for this difference.

Some German authorities claim that in certain instances kidneys, the function of which has been eliminated by x-rays, may have a restoration of function. Since, however, patients with advanced carcinoma may not live long enough to have a kidney regenerate, this form of treatment should prove useful in patients with hydronephrosis.

I recommend that alcohol be used in all women who have carcinoma of the cervix, for, regardless of the amount and character of the pains which such patients may have, at least some of the pain will definitely be relieved. This is due to the fact that most women with advanced carcinoma of the cervix develop various kinds of pains as the disease progresses.

UTERINE BLEEDING*

A Study Based Upon 1,048 Cases

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THE practice of modern gynecology is not confined merely to diseases peculiar to women but embraces many problems associated with the sexual life. It includes the essential factors which motivate and control the immediate and intimate marital relationships. A woman now expects the gynecologist to advise her not on purely medical anomalies alone but also on sexual and psychologic reactions which often produce more disturbances than the derangement induced by actual pathologic changes in the genital tract.

Similarly is this true of a gynecologic service in a hospital. The individual patient must not be treated on a basis of the pathologic findings only; the clinical signs and symptoms should be carefully analyzed before a particular method of treatment is decided upon. Care must be taken that the kind and type of treatment selected must not only cure

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the patient of her immediate symptoms but that it must not run counter to her general psychologic reactions or induce a conflict with her environment.

We must always keep the fact in mind that no two patients can be treated in exactly the same way. It is in accordance with this concept that the Gynecological Service at Lebanon Hospital has been conducted during the last twenty-five years. Dogmatism, methodism, and standardization of treatment have been contrary to our conception of the management of the gynecologic patient. We are ever ready to adopt or reject procedures which have proved worthy or unworthy. Our task is to interpret clinical signs and symptoms as they manifest themselves, treat them in order of their importance and accomplish a cure for those complaints which are most troublesome and annoying to the patient. Our axiom is first to cure the cardinal disturbance and then, if possible or feasible, correct the secondary derangements in a way that is least dangerous to the patient and in a manner that will least upset her economic equilibrium.

This study is based upon an analysis of 2,175 cases of uterine bleeding in which the patients have been admitted to the Gynecological Service of Lebanon Hospital during the last twelve years.

The patients have been divided into two general categories: (1) Bleeding caused by a derangement of the pregnant state, 1,167 cases. (2) Bleeding due to pathologic changes in the genital organs, 1,008 cases.

Recent attempts to unravel the intricate mechanism of interglandular activity with particular reference to menstruation and its disorders have focused the attention of gynecologists on the functional disorders of the genital organs. It is now fairly well established that the disorders of menstruation in particular and uterine bleeding in general may not have their origin in the genital tract, but are often induced by an endocrine disturbance. This interpretation of endocrinologic function leads to a better understanding of the management of uterine bleeding. Radical procedures have given way to more conservative methods of treatment. Surgery has been relegated to those pathologic conditions which do not lend themselves to more simple methods of treatment. Hysterectomies are less frequently performed for the cure of uterine bleeding.

The gynecologist investigates the cause of uterine bleeding from a medicosurgical standpoint, and it is only after the medical aspect of the patient is thoroughly clarified that surgical intervention is given serious consideration.

The etiologic factors, either partly or wholly responsible for uterine bleeding, may be classified on a purely clinical basis into five general divisions: (1) Inflammatory, (2) local circulatory embarrassment, (3) neoplasms, (4) functional disturbances induced by endocrine imbalance and local degenerative changes in the uterus, and (5) premenopausal bleeding.

TABLE I. CAUSES OF BLEEDING IN 2,175 GYNECOLOGICAL ADMISSIONS
1922-1933

DISORDERS OF PREGNANCY 1,167		NONPREGNANT DISORDERS 1,008									
		INFLAMMATORY 119		CIRCULATORY 48		FUNCTIONAL 220		NEOPLASTIC			
								BENIGN 586		MALIGNANT 35	
Incomplete ab.	646	Ch. endocer.	39	Retroversion	22	Precocious puberty	1	Fibromyoma	500	Ca. cervix	22
Threatened ab.	86	Ch. endomet.	23	Prolapsus ut.	26	Hemophilia	1	Ovarian cyst	22	Ca. fundus	7
Inevitable ab.	57	Ac. salping.	24			*Fibrosis ut.	218	Polyp	64	Ca. ovary	2
Complete ab.	62	Ch. salping.	19							Sarcoma ov.	2
Missed ab.	44	Pyosalpinx	14							Granulosa tumor of ovary	2
Septic ab.	7										
Miscarriage	53										
Ectopic preg.	194										
Hydatid. mole	12										
Chorionepith.	6										

*Fibrosis Uteri, Includes Menorrhagia, Metrorrhagia, Menopausal Bleeding.

1. *Bleeding Caused by Inflammatory Processes of the Genital Organs.*—This requires little discussion, though there are two definite schools of thought in connection with this problem; the purely gynecologic approach which means delaying of the operation as long as feasible, and the surgical approach which views infection in the pelvic organs in the same light as infection in the abdomen.

Ordinarily the removal of the offending organ is the ideal method of treatment no matter where it is located. But in dealing with the genital organs there are many important considerations which must be given serious thought before radical procedures are instituted. The question of reproduction is usually of serious import to the woman; the premature cessation of the menstrual function in the average woman is not desirable.

Unfortunately infection of the genital organs, both acute and chronic, often occurs during the most important part of the childbearing period—the third or fourth decade of life. Most frequently it is caused by gonorrhea or postabortal complications. These patients, suffering either from primary or secondary sterility, want to have a child, in most cases, and in nearly all cases to have the menstrual function continue. To operate or not to operate in this group of cases is a very difficult problem and one which often baffles even the most experienced gynecologist.

Even if the symptoms are annoying or troublesome, a temporary delay of operation is very often desirable in women who are likely to become maladjusted because they have no children or because they cease menstruating. Such women are less likely to be perturbed by the fact that they have no children when they reach the fourth decade of life. Surely this is true of menstruation; the younger the woman the greater is the possibility that she will be affected by an artificial menopause.

That the conservative management of an infectious process of the genital organs frequently has a favorable termination is illustrated by the following extreme case.

CASE 1.—A patient, twenty-two years of age, married two years, consulted one of us (A. J. R.) for sterility. Vaginal examination disclosed a bilateral pyosalpinx, possibly of gonorrheal origin. The tubes were enlarged, easily mapped out and adherent to the adjacent structures. Operation had been advised by several gynecologists. She refused because, as she put it tersely, "I have plenty of time to be unsexed." Twelve years later she was seen again because she had missed two of her menstrual periods. Upon examination she was found pregnant. She gave birth to a normal child and subsequently to two more children.

2. *Bleeding Due to Local Circulatory Embarrassment.*—In this group of patients, menorrhagia is the usual type of bleeding in 75 per cent of the cases. The chronic congestion causes circulatory changes in the endometrium, and not infrequently a hyperplastic endometritis will develop. This is probably the cause of the prolonged menstrual flow. When the bleeding is prolonged or profuse, the displacement needs to be corrected. The type of operation to be performed will depend on

whether the patient is still in the active childbearing period. Our preference during this period is the classical Gilliam operation, which we have done in a great many women who subsequently have had one or more children, and in whom the uterus remained in good position. A preliminary curettage is performed in order to exclude polyps, malignancy, or retained products of conception, which had become organized and adherent to the uterine wall. Vaginal pessaries for the correction of retrodisplacement of the uterus, especially in patients who had already developed menstrual disturbances, where found inadequate. They neither modify the bleeding nor correct displacements. On the whole, the use of pessaries in young women is not desirable. They often cause irritation of the posterior vaginal wall, especially when they are used over a long period of time.

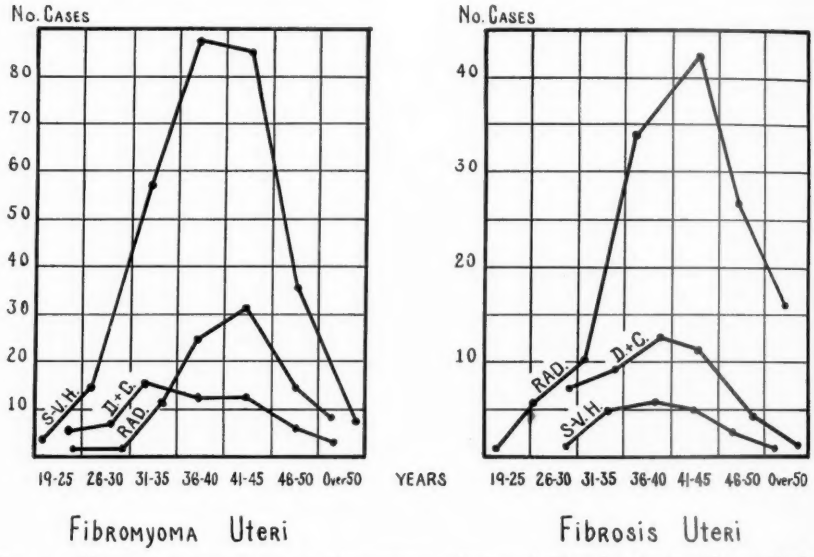

Fig. 1.—Manner of treatment of fibromyoma uteri and fibrosis uteri with particular reference to age.

It should be pointed out, however, that bleeding is not a prominent symptom in uterine displacements. In a recent study of 501 cases of prolapsus uteri, bleeding occurred in only 7 per cent of the cases.

3. *Bleeding of Neoplastic Origin.*—The management of patients suffering from fibroids of the uterus presents a special problem. The tendency to obesity and other metabolic disturbances is definitely greater among Jewish women in the fifth and sixth decades of life than in some of the other groups of the population. They are overweight and more prone to cardiovascular disorders. Many are definitely poor surgical risks. Furthermore some are compelled to carry the economic burden of the family. Undue care, therefore, must be taken as to the kind of treatment given these patients. Not infrequently, in order to assure greater safety or to accomplish a cure in the shortest possible time, we have

chosen a method of treatment that was not entirely in harmony with the accepted standards of treatment for tumors of the uterus. Hence a number of patients who had fibroids of about the size of a four or five months' pregnancy were not subjected to hysterectomy but were treated in a more conservative manner.

TABLE II. MODE OF THERAPY

OPERATION	BLEEDING FIBROMYOMA UTERI	NUMBER DEATHS	FIBROSIS UTERI	NUMBER DEATHS	TOTAL
Dilatation and curettage	63	0	51	0	
D & C, radium	117*	2 (1.7%)	163*	0	280
Laparomyomectomy	16	0			
Vaginomyomectomy	10	0			
Partial hysterectomy	3	0	1	0	
Vaginal hysterectomy	4	0	0		
Total hysterectomy	12	1 (8.3%)	1	0	
Supravaginal hysterectomy	296	8 (2.7%)	22	1 (4.5%)	
Total	521	11 (2.1%)	238	1 (0.4%)	

*Includes additional Private Cases in 1934 and 1935.

Usually we performed a curettage and inserted radium high up in the uterus. We are certain that a number of these women would not have withstood an extensive surgical operation. However, patients in whom the fibroids extended into the abdominal cavity were, as a rule, subjected to hysterectomy, especially when they complained of pressure symptoms. Supravaginal hysterectomy was the operation of choice. The incidence of malignancy in the cervical stump is not of sufficient importance to be given serious consideration. For some unknown reason cancer of the cervix is less frequent among Jewish women. The cervical stump is thoroughly cauterized before it is peritonized; that cures the endocervicitis and the leucorrheal discharge. It may also help to prevent the occurrence of malignancy since the cervical mucosa is entirely destroyed. Whether to remove the ovaries when an hysterectomy is performed is still a debatable question. Until recently it had been our practice not to remove the ovaries in patients under forty-five years of age. However, more recently, one of us (Tamis) has clearly demonstrated that there is no quantitative relationship between the amount of ovarian tissue conserved and the severity of menopausal symptoms. In fact, it is questionable whether estrin, even in large doses, is a specific for the relief of menopausal disturbances. Some of the patients who were suffering from severe flushes and sweating were found to excrete more than the normal amount of estrin. Therefore we remove the ovaries with the uterus. We have observed the patients carefully and are convinced that the absence of the ovaries does not intensify the menopausal symptoms. Often the removal of the ovaries prevents immediate and remote postoperative complications, for frequently an inflammatory reaction takes place in the tubes and ovaries, forming a cystic mass. This becomes closely adherent to the cervical stump and causes a great deal

of discomfort and pain in the lower part of the abdomen. We have been confronted with this condition on numerous occasions and have regretted that we conserved the ovaries in some of these patients.

We never tell the patients, however, that both ovaries have been removed. The average woman becomes apprehensive and fearful lest her sexual life be affected because she no longer has ovaries.

The technic usually followed is a modified clamp-ligature operation. The uterus is amputated below the internal os. The broad and round ligaments are sutured with a continuous overhead suture and are attached on either side to the angles of the cervical stump. This tends to lift up the roof of the vagina, giving additional support to the cervical stump and undoubtedly preventing its prolapse. The operation is performed speedily by this method, for all the vessels are secured in the clamps before they are ligated.

Myomectomy.—Whenever it is possible or feasible, we perform a myomectomy, especially in young women recently married, who are sterile. We follow this procedure with the full knowledge that in many of these patients it may have to be performed again. Very often the reconstruction of the uterus after the removal of a number of fibroids is a tedious process, but as long as the continuity of the genital tract is not destroyed by the removal of the tumors, there is always a chance for pregnancy.

This is best illustrated by the following case: A young woman, married two and one-half years, complained of sterility. Upon examination a large intramural fibroid, situated in the right wall of the uterus, was discovered. She was advised to have the tumor removed. She was operated upon Oct. 31, 1930. Upon opening the abdomen an intramural fibroid of about the size of an orange was found in the anterior wall, involving the isthmal portion of the fallopian tube. The enucleation of the fibroid involved the resection of the right wall of the uterus and a portion of the fallopian tube. Two small fibroids were also removed from the anterior wall. The left tube and ovary appeared normal. The patient made a good recovery and was discharged from the hospital at the end of the fourteenth day. The menstrual function continued normally without undue disturbance, except that it was somewhat prolonged. On June 8, 1932, the tube was tested for patency, and it was found open. She consulted me again July 7, 1933, stating that she had menstruated last May 23, and felt nauseated and vomited occasionally. On examination she was found six weeks pregnant. The pregnancy progressed normally and on Feb. 22, 1934, she was delivered by cesarean section of a normal child. On opening the abdomen the pregnant uterus appeared somewhat oblong and uneven. There were omental adhesions to the right side of the uterus. She made an uneventful recovery and left the hospital on the fifteenth day.

We had a number of patients who became pregnant after myomectomies had been performed on them and delivered themselves normally. At times it is very difficult to reconstruct the uterus after a number of fibroids have been enucleated; still the effort is worth while; even if pregnancy does not ensue, the menstrual function is maintained, which is an important factor especially in women who have been married a very short time.

4. *Functional Bleeding.*—There were 220 cases admitted during this period, in which no gross pathologic lesion could be discovered to account for the bleeding. For want of a better scientific term these cases have been grouped under the heading of "fibrosis uteri." We are fully aware of the inadequacy of such a clinical term. While it may present a clinical entity, it lacks a definite pathologic conception of the degenerative processes involved. Some pathologists even recommend the elimination of the term "fibrosis uteri" from medical nomenclature, because of the confusion it has created in connection with its clinical interpretation. However, there seems to be a general understanding among gynecologists of what the term implies clinically. It is the large, hard, leathery uterus most often found in women approaching menopause, causing menorrhagia and metrorrhagia.

Before the introduction of irradiation therapy these patients were subjected to curettage, and in the event that failed, a hysterectomy was performed. A better understanding of the therapeutic value of radium, however, has practically eliminated the necessity for the surgical removal of the uterus in this group of cases. During the past eight years we have seldom performed an hysterectomy for bleeding in patients suffering from "fibrosis uteri." Those patients were treated by curettage and insertion of radium high up in the uterine cavity.

5. *Premenopausal Bleeding.*—Irregular bleeding frequently occurs prior to the onset of menopause. Normally there is a lengthening of the menstrual interval and a decrease in the menstrual flow at this time. Not infrequently the opposite takes place. Theoretically this is supposed to be due to a disturbance in the hormonal control of the endometrium, brought about by an exaggeration of the anterior pituitary gonadal function. A urinalysis at this time will reveal consistently the presence of prolan. This increased prolan secretion may be interpreted as a compensatory effort to overcome the lessened ovarian activity. Perhaps this explains the occasional reappearance of the menstrual cycle in women who have already passed the menopause. The endometrial biopses fail to reveal uniformity of the pathologic processes. Lesions varying from stroma fibrosis to marked endometrial hyperplasia are observed. Recently we (Tamis) attempted to correlate the clinical history with the pathologic findings. We were forced to abandon it because of the great discrepancies found. Only when there is definite microscopic evidence of cystic glandular hyperplasia of the endometrium is it possible to interpret the bleeding as due to cystic degeneration of the ovaries. Theoretically the bleeding in these cases should be controlled by the administration of pregnancy urine extracts. Clinically it seldom proves efficacious. X-ray or radium is a much simpler method of treatment and the results are more certain.

The interior of the uterus should always be explored first. Otherwise malignancy of the body of the uterus may be overlooked. We have had

TABLE III. FOLLOW-UP DATA OF 111 CASES FIBROMYOMA UTERI TREATED WITH RADIUM

	19-25	26-30	31-35	36-40	41-45	46-50	OVER 50	TOTAL
No. cases	2	2	3	29	36	24	15	111
Clinical Result								
Cured		2	2	27	35	24	15	105
Improved	1			1				2
Unimproved	1[r]		1[x]	1[r]	1			4
Cessation of Bleeding								
Immediate	1	1	2	27	31	22	14	98
1 month postradiation		1		1	4	1	1	8
Effect on Mass								
No effect	1		1					2
Diminution in size	1	2	2	29	34	22	14	104
Complete involution					2	2	1	5
Flushes								
None or slight	2	1	2	8	12	11	7	43
Moderate				6	7	6	6	25
Severe		1		15	17	7	2	42
Late Symptoms Following Radiation								
Leucorrhea		1		8	4	4	1	18
Vesical irritation				2	4	1	1	8
Abdominal pain				6	3	4	2	15
Pruritus				2		1	1	4
Diarrhea					1			1
Rectal tenesmus				1				1
Rectal bleeding				1				1

[r]Additional x-ray or radium given.
[x]Error in diagnosis (ectopic).

TABLE IV. FOLLOW-UP DATA OF 76 CASES FIBROSIS UTERI TREATED WITH RADIUM

	19-25	26-30	31-35	36-40	41-45	46-50	OVER 50	TOTAL
No. cases	1	4	8	14	25	12	12	76
Clinical Result								
Cured		2	7	12	25	12	12	70
Improved	1	1		1				3
Unimproved		1[o]	1[o]	1[x]				3
Cessation of Bleeding								
Immediate		2	7	11	22	10	12	64
1 month postradiation				2	3	2		7
Flushes								
None or slight			3	9	14	8	11	45
Moderate			3	2	6	2	1	14
Severe		1	2	3	5	2		13
Late Symptoms Following Radiation								
Leucorrhea			1	1	2		1	5
Vesical irritation			1	2	1	1		5
Abdominal pain		1	1	3	7	1	1	14
Rectal bleeding					1			1

[o]Supravaginal hysterectomy done later.
[x]Error in diagnosis (ovarian cyst).

four cases of uterine bleeding in whom malignancy of the body of the uterus was established only after pathologic examination of the endometrial tissue was made. This should serve as a warning to overenthusiastic endocrinologists who treat premenopausal and postmenopausal bleeding with glandular extracts, without first investigating the interior of the uterus. We have had two cases of granulosal tumors of the ovary

TABLE V. ANALYSIS OF DEATHS

CASE	AGE	OPERATION	CAUSE OF DEATH
		Fibromyoma Uteri	
73473	41	D + C, Radium	Pulmonary embolus 9 days P.O. Followed by generalized gas-producing infection. Death 14 days P.O.
78632	52	D + C, Radium	Necrosis of pedunculated submucous fibroid (overlooked). Secondary infection, peritonitis. Death 5 days P.O.
47136	40	S-V. Hyst., Lt. S.O.	Generalized peritonitis. Death 2 days P.O.
52370	40	S-V. Hysterectomy	Accidental injury to bowel adherent to uterus. Generalized peritonitis. Death 8 days P.O.
55199	40	S-V. Hyst., Bil. S.O.	Cardiac failure. Death 4 days P.O.
57012	38	S-V. Hyst., Bil. S.O.	Excess P.O. vaginal bleeding. Death 25 days P.O. Autopsy, broad ligament hematoma.
59331	32	S-V. Hyst., Rt. S.O.	P.O. adhesions. Intestinal obstruction. Enterostomy. Death 13 days P.O.
66104	37	S-V. Hyst., Bil. S.O.	Cardiac failure. Death 4 days P.O.
73145	37	S-V. Hyst., Rt. S.O.	P.O. vaginal hemorrhage. Shock. Death 2 days P.O.
74257	47	S-V. Hysterectomy	Perforation of bladder. Peritonitis. Death 2 days P.O.
74809	43	Total Hyst., Bil. S.O.	Acute adynamic ileus (autopsy). Death 7 days P.O.
		Fibrosis Uteri	
64383	48	S-V. Hyst., Bil. S.O., Append.	Cardiac failure. Death 4 days P.O.

which gave clinical bleeding after the menopause. The endometrium in both patients showed marked "Swiss-cheese" hyperplasia, indicative of the extreme degree of estrogenic activity possessed by these tumors.

We prefer to use a small dose of radium over a longer period of time. We use 25 c.m.h. for sixty to seventy-two hours instead of 50 c.m.h. for twenty-five to thirty hours. Both leucorrhea and pain in the abdomen are less likely to take place following use of radium in less concentrated form.

RADIUM AND PLASTIC OPERATIONS ON THE VAGINAL VAULT

There are many patients suffering from fibrosis uteri who bleed profusely and at the same time require repair of the vaginal vault. These patients in the past usually were subjected to vaginal hysterectomy. The

results were not uniformly good. Many developed a complete eversion of the vaginal vault following the operation. In fact very often the prolapse of the vagina is so complete that it forms a hernial sack for the bladder, rectum, and small intestine. Repair of such a vaginal hernia is difficult and often a complete obliteration of the vaginal vault is required in order to cure the hernia. This is certainly an undesirable procedure for women during the fifth and sixth decade of life. The use of radium has simplified the problem. We are now able to treat them in a more logical manner, for once the problem of bleeding is eliminated, the damage to the vaginal vault can be repaired in the usual way. We have come to know that the use of radium is safe in conjunction with the vaginal plastic operation. In fact it is our impression that the healing of wounds progresses more favorably because germ life is impeded by the radium emanation. We have used radium in a number of patients who were suffering from abnormal uterine bleeding, and at the same time, we have performed the interposition operation for procidentia or other operations on the cervix and vaginal vault. The results in this group of cases were uniformly good.

CERVICAL POLYPS

Irregular bleeding caused by cervical polyps is not uncommon in women approaching menopause. The removal of the polyp and curettage does not always accomplish a permanent cure. The bleeding often recurs six to nine months later. We now use small doses of radium in these cases as a routine measure and as a prophylactic against future bleeding. We have not observed a local reaction either in the cervical canal or in the parametrium of any of the patients, although many gynecologists warn against the use of radium in such cases. However, the use of radium following the removal of submucous fibroids is contraindicated, for it may produce sloughing of the uterine surface and pyometria is likely to ensue.

POSTIRRADIATION PAIN

There is no doubt that many patients develop pain in the lower part of the abdomen following the use of radium. The pain lasts anywhere from six to eighteen months. The pain usually becomes localized in the left or right groin. It bears no relation to the site or size of the fibroid. On the contrary it seems that the pain is less intense in patients who have large fibroids than in those who have small fibroids, and it is more pronounced in subperitoneal fibroids. It is difficult to assign the cause for the pain. It may be that the involutionary process is accompanied by pain, because of trophic disturbances which take place in the growth, causing greater sensitivity of its nerve supply. The pain may also be caused by the degenerative changes which take place in the ovaries, and this may be the reason why it is localized in the groins. But the pain is not permanent, for it gradually subsides.

POSTIRRADIATION LEUCORRHEA

A small number of patients develop a severe vaginal discharge after the use of radium. The discharge at first is thick and greenish in appearance; later it becomes watery. It is annoying and troublesome to the patient, often irritating the vagina, cervix, and even the vulva. Being constantly bathed by the discharge these parts become highly congested, causing undue smarting of the surfaces and even pain. Curiously enough, patients who develop leucorrhea seldom complain of pain in the abdomen. We have never been able to explain this clinical phenomenon. The discharge most likely is due to a burn of the uterine surface which takes a long time to heal. This was recently illustrated in a case of uterine bleeding in which radium was used. The pathologic report of the uterine scrapings proved to be carcinoma of the body of the uterus. Four weeks later a panhysterectomy was performed. A radium burn of the mucous surface, about the size of a half dollar, was found on the anterior wall of the uterus. Curiously enough, careful sectioning of the uterus disclosed no traces of malignancy in the endometrium. The pathologic examinations were made by the same pathologist. The healing process of the uterine wound is delayed, for notwithstanding the fact that gravitation favors uterine drainage, the internal os is too small to permit the complete escape of the mucopurulent discharge produced by the granulating surface.

VESICAL IRRITABILITY

We have not encountered much postirradiation vesical disturbance in this series of cases. Some patients complained of more frequent micturition. Many of these patients suffer from vesical tenesmus prior to the operation; therefore, the bladder disturbance which follows the operation cannot be correctly evaluated. Many of the bladder symptoms can be obviated if the radius is introduced high into the pelvic cavity, away from the bladder.

An analysis and study of 1,048 cases of uterine bleeding leads us to the following conclusions:

1. Hysterectomy should be performed only in those patients who have no local or constitutional contraindications for the operation.

2. Patients who have definite metabolic disturbances and are overweight or who manifest cardiovascular derangements, should not be subjected to a hysterectomy even if the uterus is larger than three months' pregnancy. The risk of an operation is too great in such group of patients. Curettage and the insertion of radium will stop the bleeding.

3. Patients whose hemoglobin index is low, 50 per cent or less, should have the bleeding temporarily controlled by curettage and irradiation, a major surgical procedure should be deferred and performed only when the patient has sufficiently recuperated from the loss of blood.

4. Supravaginal hysterectomy should be the operation of election. It is definitely a safer procedure in the hands of the average gynecologist. The cervical stump should be thoroughly cauterized before it is peritonized; this helps to cure the endocervicitis.

5. The tubes and ovaries should be removed in patients over forty-five years of age. Many of these patients have an insidious inflammation of the tube or ovary at the time of the operation, which becomes more acutely inflamed after manipulation and produces pain and tenderness in the lower portion of the abdomen for a long period of time.

6. Patients who suffer from intramural or flat subperitoneal fibroids and the uterus is enlarged to about the size of a three months' pregnancy should be treated by curettage and radium.

7. Bleeding associated with "fibrosis uteri" can almost always be controlled by curettage and radium.

8. Patients in the fifth decade of life who suffer from cervical polyps should have small doses of radium; 800 to 1,000 mc.h. has a prophylactic measure against future bleeding. Many of these patients suffer from associated "fibrosis uteri" which sooner or later causes menorrhagia or metrorrhagia.

9. Vaginal plastic operations may be performed conjointly with the use of radium.

10. A small dose of radium to be used over a longer period of time is preferable to a large, highly concentrated dose. There is less likelihood of an intrauterine radium burn taking place when small doses of radium are used. The average dose used to control bleeding in this series of cases was about 1,800 mc.h. The smallest dose was 800 mc.h., the largest was 2,400 mc.h. The dosage varied depending upon the age and local condition of the patient.

11. The degree of the severity of the menopausal symptoms is about the same after the removal of the uterus or after the use of radium or when one or both ovaries are removed in women over forty-five years of age. To a large extent the symptoms of artificial menopause depend upon the nervous stability of the patient.

12. Pain in the lower portion of the abdomen frequently follows the use of radium which lasts anywhere from six to eighteen months.

13. The use of radium is definitely contraindicated in patients suffering from submucous fibroids, sloughing of endometrium or even pyometria is likely to take place.

Uterine bleeding of nonmalignant origin is probably the most frequent symptom the gynecologist is called upon to treat. No single method of treatment is applicable to all cases. Success in combating this troublesome condition depends upon the proper interpretation of the clinical signs and symptoms, both local and general, and then instituting a form of treatment that is least inconvenient or least dangerous to the life of the patient. The management of uterine bleeding

in this series of cases clearly indicates how diversified and selective we have been in our methods of treatment.

DISCUSSION

DR. FREDERICK H. FALLS, CHICAGO, ILL.—We will agree that we should be very conservative about the treatment of uterine bleeding where the cause of the bleeding is inflammatory, since by conservative treatment we find that as the inflammatory process improves, the bleeding stops.

As far as the circulatory embarrassment due to malposition is concerned, one rarely has to do anything radical. We feel that only occasionally is a suspension of the uterus necessary for a retroversion that is causing bleeding. Frequently holding the uterus in position for a time with a pessary will so improve the ovarian circulation that the bleeding will stop. Many of these bleedings are due to circulatory changes in the ovary rather than in the uterus. I believe it is a hormone reaction, producing hyperplastic changes in the endometrium.

We would hardly want to say that malignancy after supracervical hysterectomy is negligible. On the other hand, we do not believe that because this may occur it is necessary to do a total hysterectomy in all cases. For this reason in all cases of fibroids in our clinic we do a cautery of the cervical stump as a preliminary to the hysterectomy, and when there is a positive Schiller test we do a biopsy to be sure that we have not an early concomitant carcinoma. In that case we would do a total hysterectomy.

We feel that radium should be used only in fibroid cases that have not advanced to a size larger than a three months' pregnancy. In certain cases of large fibroids where there has been extreme exsanguination we feel that curettage and a small dose of radium may stop the bleeding temporarily. Then we can transfuse the patient and operate, or if we wait four, five, or six weeks she is in better condition for the necessary hysterectomy.

We agree on the question of myomectomy in women who are bleeding and are in the childbearing age and are anxious to have a baby. If the myomectomy is done and the woman becomes pregnant, especially if she is elderly, a cesarean section should frequently be done in the interest of the baby.

As to the fibrous uteri, I think we all agree that a small dose of radium is probably the best form of treatment. In all cases, however, one should be very careful to look for malignancy, not only by curettage but by very careful biopsy. We have recently adopted the rule of doing a Sturmdorf operation in doubtful cases, and making multiple sections from the cone removed to detect an early carcinoma.

DR. PAUL TITUS, PITTSBURGH, PA.—This paper of Dr. Rongy's is not exactly the type of paper that lends itself readily to discussion because it is so general in its scope. It seems to me that it is more a study that will be used later for reference because of its general nature and perhaps because it is to a certain extent a statistical survey. Probably it is on this account that Dr. Rongy made no particular effort to summarize his findings, and that is a suggestive criticism that I should like to make of this paper if Dr. Rongy would permit.

He stated first that there are two general types of bleeding, those associated with pregnancy, and those not so associated. Of the latter we have to deal with those occurring during and after the childbearing age. In the first of these the cause of the bleeding often causes sterility, and when correcting the cause of the bleeding, efforts should be made to conserve the childbearing function. These very briefly were the outstanding points that seemed worthy of particular emphasis.

DR. HENRY SCHMITZ, CHICAGO, ILL.—It is unfortunate that usually papers on uterine bleeding are published in the special journals instead of in journals

which are read by the general medical profession, as there is much confusion in the minds of the nongynecologic men about the methods of treatment to be used in uterine bleeding.

It is impossible to discuss all of the points mentioned. In a study of 2,000 consecutive gynecologic patients the symptom of bleeding was found in one-fourth of the patients. When the character of the bleeding was analyzed, we found that the most frequent bleeding was a profuse or prolonged menstrual flow. This occurred in about 60 per cent of the cases. In 20 per cent the menstruation occurred too soon, and we may conjecture that the too frequent menses are due to some abnormal function in the ovulation process of the ovary. In another 20 per cent menstruation was entirely irregular and might properly be termed metrorrhagia. The latter results from the loss of continuity of the surface epithelium. About 23 per cent of these patients with metrorrhagias had uterine carcinoma.

Every patient should be carefully studied to find the cause of the functional bleeding. Medical treatment is invariably instituted, first because a great number of such cases are due to an endocrine dysfunction. About one-third of such patients may be benefited by endocrine or medical treatment. If endocrine or medical treatment does not help, one should resort to curettage. Another one-third of these functional bleedings are arrested thereby. If the hemorrhage, especially in younger people, should recur, we do not hesitate to repeat the curettage. Finally, one-third of the entire group of functional bleeding remain, that require radium therapy. The patients are placed in age groups. The first group is the adolescent group, comprising patients twenty years old or younger; the second group is the mature group, from twenty to forty years old; the third group is the climacteric group, forty to fifty years old; and the fourth group is the senile, postmenstrual group in patients fifty-one years or older. Radiations are used mostly in the third and fourth groups.

Dr. Rongy spoke of the occurrence of pain and leucorrhea following radiation therapy. These complications can be prevented either by the use of roentgen therapy, with which the time of treatment may be reduced to thirty to forty-five minutes, or by the use of radium, which is placed in a Y-shaped brass filter, so that the areas at the fundus receive the cauterizing effect of the Gamma rays, and not the region of the internal os. Injury of the internal os may lead to scar tissue formation and stenosis. Retention of the uterine secretions then causes pain.

DR. EMIL NOVAK, BALTIMORE, MD.—Unfortunately, Dr. Rongy did not have time to do more than merely mention, perhaps, the most interesting type of bleeding, the so-called functional variety, so that it would scarcely seem proper to include this in the discussion. In presenting his classification of types, he distinguished a functional and a menopausal type. I do not see why he makes such a subdivision, as by menopausal bleeding he evidently indicates merely the type of functional bleeding noted at or near the menopausal age. It would seem no more entitled to separate distinction than the functional bleeding of puberty.

In speaking of inflammatory causes of bleeding, which are not numerically very important, he describes a case in which pregnancy supervened some time after a pyosalpinx was diagnosed. The inflammatory cases in which the prognosis for future pregnancies is least unfavorable are the postabortive or puerperal varieties, in which the streptococcus or staphylococcus are most frequently the causative organisms. The reason for this lies in the fact that these organisms attack the tube by way of the lymphatics rather than by the mucosa, which often is quite intact even in tubes enormously enlarged by interstitial inflammation, so that the lumen is likely to remain patent. The gonococcus, on the other hand, begins as an endosalpingitis, with frequent destruction of the mucosa and usually blocking of the lumen.

I understood Dr. Rongy to say that he routinely employs radium after the removal of cervical polyps. The vast majority of cervical polyps, however, are small and obviously benign, and if there is any doubt at all, this can be settled by microscopic examination, so that there would seem to be no reason for the routine use of radium in such cases. In cases of myoma, one should remember that the existence of such a tumor does not necessarily mean that it is the cause of the patient's bleeding. If the uterus is curetted, or if the uterus is opened up immediately after removal, as it should be, one may occasionally get a surprise by finding an unsuspected adenocarcinoma of the corpus associated with the myoma.

DR. DAVID W. TOVEY, NEW YORK, N. Y.—I think the ovaries should always be saved if one has not, after removing the fibroid, interfered too much with the circulation. If the circulation has been disturbed, it will be necessary to sacrifice them.

In regard to supravaginal hysterectomy, with cautery destruction of the mucosa, operation from above does not always get the carcinoma, since it is in the vaginal portion of the cervix. There is no doubt that more vaginal hysterectomies should be done as you get the whole uterus, and it can be done under local anesthesia very easily.

DR. RONGY (closing).—The incidence of carcinoma in the cervical stump is not a great problem to us, for it is a fairly well-established fact that the occurrence of cervical carcinoma in Jewish women is very much less than in any of the other groups. We cauterize the cervical stump after supravaginal hysterectomy through the abdominal wound before it is peritonized. This helps to cure the endocervicitis and the leucorrheal discharge. It may also help to diminish the incidence of carcinoma of the cervical stump, because the lining of the cervical canal is destroyed.

As to cesarean section in patients who have had myomectomies, that, of course, depends to a large degree upon the extent of the uterine scar as a result of the removal of the fibroid tumors. All patients in labor, who have had previous myomectomy, must be watched very carefully. If labor progresses tediously it is not always safe to leave these patients alone, and delivery has to be accomplished by cesarean section. Especially is this true in elderly primiparas.

I accept Dr. Titus' criticism. I did not summarize the paper for the reason that it was a general discussion of the various phases of uterine bleeding and their treatment.

We find that when patients complain of severe leucorrheal discharge following the use of radium they seldom complain of pain. The pain which occurred in many of our cases may last as long as eighteen months, and it disappears only when the uterus has undergone involution and the tumors have practically disappeared.

Regarding the use of radium in conjunction with the removal of cervical polyps, I did not have in mind those patients who suffer from cervical polyps during the childbearing period, but patients who have cervical polyps during the premenopausal period and who suffer from irregular spotting and bleeding. I think it is a good practice in that group of cases to use a small dose of radium after the polyps have been removed, in order to make sure that the menstrual function will disappear.

A great number of physicians take it for granted that irregular bleeding in the latter part of the fifth decade is quite normal, and many serious conditions of the genital tract are overlooked as a result of it. It is, therefore, advisable to think of bleeding during that period as a separate entity and possibly more attention will be given to it both by patient and physician.

I believe that on the whole vaginal hysterectomy should be performed only in those cases where sufficient relaxation of the vaginal vault is present and where the uterus is not larger than the size of a three months' pregnancy.

VESICOVAGINAL FISTULA*

Management and End-Results

Louis E. Phaneuf, M.D., Sc.D. (Hon.), F.A.C.S., Boston, Mass.

When J. Marion Sims operated for the thirtieth time on his patient, Anarcha, in May, 1849, and successfully closed her vesicovaginal fistula by means of silver wire sutures, a new era was opened in the treatment of this distressing condition. Vesical fistulas have decreased in frequency with the improvement of obstetric practice, yet the accident occurs occasionally, even at the present time. If the obstetric fistulas have decreased, the surgical injuries of the bladder, resulting in fistulous openings, have increased because of the greater number of surgical interventions involving the pelvic organs, which are practiced today. In order to gain some idea of the incidence of vesicovaginal fistula, I have reviewed the last 10,000 consecutive gynecologic and obstetric histories of my own patients and have found ten of these lesions in the group, an incidence of one in one thousand.

Most fistulas, due to the trauma of labor, are caused by pressure necrosis and sloughing rather than by forceps cuts or lacerations of the tissues, although it is true that in most of these cases the labor was terminated instrumentally. Etiologically, the disorder is due to the fact that the forceps were used after a long labor, when necrosis had already occurred, rather than when they were used too early. In some instances the bladder may be ground against the pubic ramus of one side or the other by the forceps. Surgical vesicovaginal fistula may be the result of injury to the bladder during certain operative procedures, as panhysterectomy, abdominal or vaginal. Operations for the cure of cystocele and uterine prolapse, such as vaginal fixation of the uterus, the interposition operation and less extensive interventions on the anterior vaginal wall and bladder, may also be responsible for a definite number of these lesions. Surgical obstetric methods like the vaginal cesarean section may account for a few of these disorders. Two factors are responsible for the production of surgical fistulas: first, direct operative injury, and second, necrosis and sloughing due to interference of the blood supply of a local area of the bladder. When due to operative injury, the fistula appears soon thereafter; when due to necrosis and sloughing, a number of days elapse before urinary leakage is apparent. Syphilis, tuberculosis, and carcinoma,

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by erosion and ulceration, may cause a bladder fistula, while the constant pressure of foreign bodies, the most common of which is the pessary, may be the etiologic factor in a rare case.

Two types of fistulas offer great difficulties, (1) those in which there is extensive loss of tissue, and (2) those which are situated high in the vaginal vault and adherent to bone. The surgical fistulas, because of their location, are usually more difficult to close than the obstetric, and numerous technics have had to be devised in order to reach them.

The treatment of vesicovaginal fistula is surgical. The preparation of the patient is of prime importance. The vagina, the vulva, and the inner surface of the thighs are involved in an inflammatory process resulting from the irritation of these parts by the constant dribbling of urine. Incrustations of urinary salts, in the form of phosphatic deposits, are found in these areas, and the formation of granulation tissue and ulceration are sequelae of this irritation. Urinary antiseptics in the form of methenamene and acid sodium phosphate, 5 gr. (0.300 gm.) each, should be administered four times a day and fluids should be given in large amounts. An indwelling catheter should be introduced in the bladder in the hope of directing some of the urinary flow away from the parts. The urinary deposits may be removed by means of warm, mildly acid, irrigations, a warm solution of acetic, hydrochloric or nitric acid, 1 to 1,000 answering the purpose. The irritated surfaces are then painted with a 10 per cent solution of silver nitrate, and the parts are protected by the free application of a bland ointment such as diachylon ointment and others. Even with this regime it may take two to three weeks to get the parts in condition to operate upon them.

The silver wire suture is responsible today "for the absence of inflammation and tumefaction" just as it was in May, 1849, and can still be used to great advantage in closing vesicovaginal fistulas. The classical Sims operation is applicable to many of them; in others, the bladder may be freely mobilized, the bladder opening closed in layers with fine chromic catgut, avoiding the bladder mucosa, and the vaginal wall approximated by means of interrupted silver wire sutures. This latter technic has served me well and has been responsible for good results in extensive bladder fistulas.

Several methods of closing a vesicovaginal fistula have been devised since the publication of the original Sims technic. In the main, these methods consist of (A) the vaginal operation of which there are several varieties, and which include: (1) paring the edges and closing in one layer with silver wire, (2) mobilization of the bladder and closure of the bladder and vagina in separate layers, (3) making use of the cervix and body of the uterus to close the opening, (4) suturing pedicled flaps from the vagina and vulva to bridge over the area, (5) using the gracilis muscle as a pedicled flap (Garlock technic), (6)

colpocleisis. (B) The intravesical operation through a suprapubic incision, best illustrated by the method of Hugh H. Young. (C) The suprapubic extraperitoneal operation through a Pfannenstiel incision. (D) The intraperitoneal operation through an abdominal incision (Legueu operation). This is especially useful in fistulas consecutive to abdominal panhysterectomy. (E) Implantation of the ureters in the rectum (Coffey technic).

Ward and Farrar have devised ingenious methods for the closure of extensive vesicovaginal and urethrovesicovaginal fistulas.

In my 10 vesicovaginal fistulas the accident was due to obstetric causes in 4, to obstetrical-surgical causes (vaginal cesarean section) in 1, and to surgical causes in 5. Four of these fistula cases (1, 3, 4, and 6) occurred in my hands, while the 6 others occurred in the hands of other surgeons. Twenty-seven operations were necessary to close these 10 bladder fistulas; of these 8 were performed by others and 19 by me. I was successful in closing 9 of these fistulas while the tenth was closed by another surgeon after I had failed in the first attempt by the classical Sims operation. In these 10 cases, 1 fistula was closed by the suprapubic extraperitoneal method, after failing by the suprapubic intravesical and vaginal procedures. No fistula was successfully closed by the intravesical method which was used four times, although in one instance the patient had remained dry for two months after its performance. The vaginal method was responsible for the closure of 9 of the fistulas and the suprapubic extraperitoneal method for 1.

REPORT OF CASES

CASE 1.—Mrs. J. H., forty-six years of age, was operated upon by me at the Carney Hospital for a large cystocele, rectocele, and hemorrhoids on July 16, 1920. The interposition operation was performed for the cystocele, a median flap perineorrhaphy for the rectocele, and the hemorrhoids were removed by the clamp and cautery method. She obtained a good result for these operations except for the fact that a small vesicovaginal fistula developed in the region of the upper stitch, which attached the uterus to the vaginal wall. On Aug. 31, 1920, the fistula was closed by the classical Sims operation, using silver wire sutures. Healing took place by first intention and the patient was discharged cured.

CASE 2.—Mrs. J. McE., forty-seven years of age, had had an abdominal panhysterectomy performed in her home city at Prince Edward Island. She was admitted to the Carney Hospital with a large incisional hernia and a vesicovaginal fistula which was found in the line of healing of the vaginal cuff and which readily admitted the thumb. The bladder was contracted. On Nov. 1, 1920, the vesicovaginal fistula was pared and closed in one layer with silver wire sutures by the Sims technic. The incisional hernia was then repaired. A good result was obtained for the hernia but only about one-half of the fistula healed. On Dec. 16, 1920, the edges of the remaining fistulous tract were pared and closure was accomplished with silver wire sutures in one layer. An excellent result was obtained at this second operation and the patient was discharged cured.

CASE 3.—Mrs. D. B., forty-five years of age, was operated upon by me at the Carney Hospital on Feb. 6, 1926. The diagnosis: menorrhagia, metrorrhagia,

laceration of the cervix, fibrosis uteri, and relaxation of the perineum. A vaginal hysterectomy and perineorrhaphy were performed. On February 12, six days after operation, urinary leakage was noticed on her pad, and a definite vesicovaginal fistula developed. On April 17, 1926, the classical Sims operation was performed, the edges of the fistula were denuded, and it was closed in one layer with silver wire sutures. The fistula healed readily. The patient was examined on May 1, 1926; there was no urinary leakage and she had good bladder control.

CASE 4.—Mrs. M. R., twenty-eight years of age, was admitted as an emergency case to the Carney Hospital on Nov. 25, 1923. She had valvular heart disease in the form of pulmonary stenosis with decompensation, this diagnosis having been made by the Medical Service. She had been in labor forty-eight hours; her cervix was two fingers dilated and the vertex, presenting in R.O.P., was overriding the symphysis. Her condition was desperate. She was delivered by a low cervical cesarean section, under local anesthesia, and recovered. Her second pregnancy occurred in 1926. At the end of eight months of this pregnancy cardiac decompensation again occurred, and she entered the hospital on March 9, 1926, where she was delivered by a second low cervical cesarean section, under local anesthesia. She also recovered from this operation. She showed signs of cardiac distress early in her third gestation, which had reached seven months when she collapsed. Since the fetus was small and was thought to be dead in utero she was delivered, by a vaginal cesarean section, under spinal anesthesia, on May 23, 1927, the anterior and posterior cervical lips being incised. The bladder was very adherent and was separated with difficulty. A male fetus, showing early signs of maceration, was delivered by version and extraction. The bladder, which was injured at delivery, was repaired immediately, but a small vesicovaginal fistula soon developed. She was discharged on the forty-fourth day after operation, her long stay in the hospital being due to the cardiac condition. At this time the bladder held 8 ounces of urine and the vaginal leakage was slight. On June 12, 1928, she was operated upon for the fistula which was found near the middle line and one and one-half inches (3.75 cm.) below the urinary meatus. A lateral episiotomy was done on the right side, the anterior vaginal wall was opened longitudinally in the middle line and two lateral flaps were separated, the bladder opening was closed with interrupted sutures of No. 0 chromic catgut, the bladder mucosa being skipped, the bladder musculature was approximated over the first suture line by a continuous stitch of the same material, the anterior vaginal wall was approximated by interrupted sutures of No. 2 chromic catgut. The episiotomy was repaired with No. 2 chromic catgut and silkworm gut. At the completion of operation the vagina was filled with gauze and the bladder with a solution of methylene blue. No leakage occurred. The healing was imperfect, however, as there was recurrence of the fistula. She was advised to return to the hospital at a later date, but she disregarded this advice and was subsequently operated upon elsewhere by another surgeon, who successfully closed the fistula.

CASE 5.—Mrs. H. C., twenty-eight years of age, had a difficult forceps delivery in another city, after eighty hours of labor, resulting in a stillborn child and a large vesicovaginal fistula to the right and behind the right pubic ramus, to which it was firmly adherent. The fistula was inaccessible to the vaginal route. The first operation was performed on July 18, 1929, at the Carney Hospital and consisted of a suprapubic intravesical closure. She was discharged on the twenty-second day after operation with a small opening at the site of the original fistula. The second operation was performed on Dec. 3, 1929, the fistula being pared and closed vaginally with eight silver wire sutures. At the end of operation the bladder was filled with methylene blue solution and the vagina with gauze, there apparently being no leakage. She remained dry for ten days, after which leakage occurred. The third operation was performed on March 28, 1930, and consisted of a vaginal closure. A

transverse denudation was made around the fistula, dissecting out a cuff of vaginal mucosa and the edges of the vagina around it. The vaginal cuff was sutured over the opening by a continuous stitch of No. 0 chromic catgut, thus forming a plug of denuded vaginal mucosa directly over the fistula. The undermined edges of the vagina were approximated over this with eight silver wire sutures. Urinary leakage occurred after six days. The fourth operation was performed on July 8, 1930, and consisted of a suprapubic intravesical closure. She was well for three days when urinary leakage recurred. The fifth operation was performed on Feb. 9, 1931, and consisted of a suprapubic extraperitoneal closure. A transverse abdominal incision above the symphysis was made, cutting across both recti muscles and exposing the bladder extraperitoneally. The bladder was separated from the right pubic ramus and from the vagina, the adhesions being very firm. The right uterine artery, which was completely exposed, was ligated at its origin and cut. The right ureter was dissected for about two inches (5 cm.) up to its entrance in the bladder, so as not to tie it during closure. The bladder opening was about 3.75 cm. by 2.5 cm. The vaginal wall was closed with interrupted sutures of No. 2 chromic catgut, which did not penetrate the surface vaginal mucosa. The scar tissue at the edges of the bladder opening was resected. In the dissection the superior surface of the urethra was exposed and opened. A self-retaining catheter was introduced in the bladder, through the urethra, and the superior surface of the urethra closed over the catheter for an area about one inch (2.5 cm.) in length by mattress sutures of No. 2 chromic catgut. The bladder opening, after resection of the scar tissue around its edges, was about 1.6 by 1.2 inches (4 by 3 cm.), and was triangular in shape with the apex at the urethral opening. It was closed with interrupted sutures of No. 0 chromic catgut. The first layer of sutures was covered over by the bladder muscularis, using a running stitch of the same material. At the completion of operation the vaginal and bladder openings were far apart. The abdominal incision was closed in layers with drainage. The large bladder fistula healed successfully but necrosis set in in the dissected portion of the right ureter and a small ureterovaginal fistula appeared. At the time of this last operation pregnancy existed. This had not even been suspected, since it was thought that the marked incrustation of the vagina made coitus impossible, and since she had stated that she had had a regular period twelve days before entering the hospital. She went through the pregnancy uneventfully except for the leaking of a small amount of urine from the fistula of the right ureter. On Aug. 18, 1931, she entered the hospital after four hours of labor. Because of her generally contracted pelvis and the scar tissue in the region of her bladder, she was delivered by a classical cesarean section of a female child. On the fourteenth postoperative day her abdominal incision separated and a loop of ileum was extruded. Under spinal anesthesia the loop of ileum was reduced and the incision was closed with through-and-through silkworm gut sutures. Both mother and baby were discharged in good condition after this operation. The sixth operation was performed on Jan. 23, 1932, and consisted of the implantation of the right ureter in the fundus of the bladder. This healed successfully and stopped all leakage. On June 24, 1932, intravenous urograms were made by Dr. Roger C. Graves of the Urological Department of the Carney Hospital. The right renal pelvis and right ureter were not outlined, suggesting a lack of excretory function on that side. The left kidney outline looked a little larger and decidedly larger than the right kidney shadow. This represented some compensatory hypertrophy on the left and perhaps some atrophy on the right. The patient was enjoying the best of health.

CASE 6.—Miss G. L., nineteen years of age, was operated upon by me at the Beth Israel Hospital for a solid carcinoma of the left ovary, which was diagnosed by a frozen section at the time of operation. A very simple panhysterectomy with

the ablation of the adnexa was performed. The vaginal vault was closed tightly, without drainage. Ten days after operation a small vesicovaginal fistula appeared in the vaginal vault. This was apparently due to a small slough following interference with the blood supply of a small area of the bladder, following its wide dissection. On June 6, 1929, she was seen in consultation with a urologist who attempted to close the fistula by a suprapubic intravesical operation. This, however, was not successful. On Oct. 29, 1929, I operated vaginally by making an incision in the vaginal wall around the fistula, dissecting two vaginal flaps, and freely mobilizing the bladder. The vesical opening was closed by a continuous suture of No. 0 chromic catgut, which skipped the mucosa. A second layer of muscularis was approximated over the first suture line by a continuous stitch of the same material. The vaginal wall was approximated over this with silver wire sutures. Healing took place by first intention and the patient has remained well since.

CASE 7.—Mrs. B. L., thirty-one years of age, had a vesicovaginal fistula extending from below the urinary meatus to the cervix, following an instrumental delivery. There had been two unsuccessful attempts at closure in another state before she was admitted to the Carney Hospital. On Oct. 24, 1930, the vaginal wall was dissected from the fistula and freely separated, thus mobilizing the bladder. The bladder rent was closed with a running stitch of No. 2 chromic catgut, skipping the mucosa, the bladder muscularis was approximated over this, as a second layer, with interrupted sutures of No. 1 chromic catgut. The vaginal wall was united with ten silver wire sutures. It was found that the lowermost stitch closed the cervical os, in coapting the edges of the denuded area. It was removed, leaving nine silver wire sutures. Healing occurred by first intention, there being no leakage whatsoever after operation. She obtained an excellent result and was discharged cured.

CASE 8.—Mrs. C. F., thirty-one years of age, had a urethrovesicovaginal fistula and a complete laceration of the perineum following a version and extraction, the child being stillborn. In May, 1932, she was operated upon in another city, an attempt being made to close her fistula. There was urinary leakage when she got out of bed and this persisted until she was admitted to the Carney Hospital, where, on June 24, 1932, she was operated upon, a classical Sims operation being performed, using five silver wire sutures. This operation was unsuccessful. On Sept. 26, 1932, she was again operated upon. A median incision was made in the anterior vaginal wall and two lateral flaps were fully dissected, exposing a small fistula in the posterior urethral wall and a large vesical fistula below it. It was then found that the last operation had failed because the urethral fistula had not been discovered at that time and that urinary leakage had occurred under the vaginal wall. The fistulas were closed separately in three layers, the first with No. 2 chromic catgut, interrupted sutures, skipping the mucosa, the second and third reefing over the bladder and urethral muscularis by means of continuous sutures of No. 0 chromic catgut. The vaginal wall was approximated with silver wire sutures, eight in number. The closure was satisfactory and healing took place without complications. On Dec. 10, 1932, her complete tear of the perineum was repaired with success. She was discharged with a healed bladder and urethra, a well-functioning anal sphincter and a good perineal body. She was examined on Oct. 13, 1934, at which time the perineum was satisfactorily restored, the vagina was dry, she had good bowel and bladder control, and felt well.

CASE 9.—Mrs. H. T., thirty-three years of age, had a vesicovaginal fistula in the upper left vault under the left pubic ramus, following an injury to the bladder which occurred elsewhere during the performance of a supravaginal hysterectomy for pelvic inflammatory disease. The cystoscopic examination showed the fistula to

be located just below the opening of the left ureter. She was operated upon at the Carney Hospital on July 10, 1933. A catheter was introduced in the left ureter through the urethra and a Schuchardt incision was made on the left side. The fistulous opening was denuded and two vaginal flaps were formed. The scar tissue was resected around the margins of the fistula. The bladder opening was closed in two layers, using continuous sutures of No. 0 chromic catgut, and the edges of the vaginal wall were approximated with five silver wire sutures. Urine ran out of the left ureteral catheter after the closure. This operation, however, was unsuccessful, urinary leakage taking place soon thereafter. On Aug. 28, 1933, another attempt was made, resorting to the suprapubic intravesical method. A Pfannenstiel incision was made, the bladder was exposed, and the peritoneum was reflected superiorly. The bladder was opened in the median line; the fistula was found in the floor of the bladder, 0.5 to 0.8 inches (1¼ to 2 cm.) below the left ureteral opening, and contained a great deal of granulation tissue. The granulations were curetted away, the edges of the fistula were pared, the vagina was closed with four interrupted sutures of No. 2 chromic catgut, the vesical opening with five interrupted sutures of the same material and the bladder mucosa with a running stitch of No. 0 plain catgut. The bladder was closed around a suprapubic No. 28 Pezzer catheter and the abdominal incision was closed in layers. Healing took place satisfactorily, the patient was dry for two months and was discharged as cured. Shortly thereafter she reported again and urinary leakage from the old fistula was discovered. On March 16, 1934, she was operated upon for the third time. The Schuchardt incision was reopened and the fistula was discovered to the left of the cervical stump near the left pubic ramus. A midline incison was made in the anterior vaginal wall, a right flap was dissected, the left flap was dissected with great difficulty because of scar tissue. The bladder opening was closed in two layers, the first consisting of interrupted sutures of No. 2 chromic catgut, burying the bladder mucosa within the bladder, and a second layer of muscularis was approximated with a running suture of the same material, burying the first. The vaginal wall was united with seven sutures of silver wire. The patient was kept on her abdomen for the first ten days, then alternating between her abdomen and her back until the indwelling catheter was removed on April 6, the twenty-first postoperative day. The silver wire sutures were removed on April 20, 1934. There was no leakage at any time following this third operation. She was examined in June, September, and December, 1934; she was free from symptoms and in excellent health.

CASE 10.—Mrs. O. L'R., forty-five years of age, had a large vesicovaginal fistula extending from the urinary meatus to the cervix, following a version and breech extraction for a hydrocephalic child done in a neighboring city. Three previous unsuccessful vaginal operations had been performed by another surgeon. The bladder was markedly contracted and its walls were thickened. On Feb. 2, 1934, she was operated upon at the Whidden Memorial Hospital, Everett, Massachusetts. The fistula was freed on all sides, two flaps of anterior vaginal wall were dissected and the bladder was well mobilized. The bladder was sutured in two layers using continuous sutures of No. 0 chromic catgut. The posterior wall of the urethra, which was involved in the fistula, was reconstructed over an indwelling catheter with interrupted sutures of No. 0 chromic catgut. The scar tissue at the edges of the vaginal flaps was resected and the vaginal wall was approximated from urethra to cervix with ten silver wire sutures, which were removed on March 6, 1934. There was no leakage whatsoever after operation. The patient was examined in June and September, 1934. At the last examination it was noted that the bladder capacity had increased considerably and that she had good urinary control.

SUMMARY

1. A review of 10,000 consecutive, personal gynecologic and obstetric histories disclosed 10 vesicovaginal fistulas, an incidence of 1 to 1,000.

2. The fistulas in these 10 women resulted from obstetric causes in 4, from obstetrical-surgical causes (vaginal cesarean section) in 1, and from surgical causes in 5.

3. Twenty-seven operations were necessary to close these 10 bladder fistulas; of these, 8 were performed by other surgeons and 19 by me.

4. The largest number of operations on one patient was 6, and the smallest number was 1.

5. Nine of these fistulas were closed through the vagina and one by a suprapubic extraperitoneal operation. No fistula was closed by the suprapubic intravesical method which was used four times.

6. I was successful in closing 9 of these fistulas while the tenth was closed by another surgeon after I had failed at a previous operation.

7. The various operative methods are discussed and the details of 10 cases are reported.

DISCUSSION

DR. JOSEPH L. BAER, CHICAGO, ILL.—The three factors that enter into success in the treatment of vesicovaginal fistula are the preoperative preparation of the patient, the technic, and the postoperative care. Dr. Phaneuf takes infinite pains and unlimited time in preparing the patient. The points in technic which stand out are first, the fact that he retains the use of silver wire for the vaginal closure. You will have noted that he obtained primary results for the first three of this series by using the classical Sims' method of through and through silver wire. In the fourth, where he used only chromic catgut, he had a failure; and in the remainder where he used a combination of buried chromic catgut and silver wire for the vaginal mucosa he had six successes.

With the ordinary vesicovaginal fistula, I think it desirable when possible so to place the lines of repair in the bladder and the vagina, respectively, that they are not directly overlying; if possible they should be stagger sutures. Second, for the high, rather inaccessible and very small fistula, it is sometimes simpler to circumcise the vaginal orifice and invaginate the cuff into the bladder. The harm to the bladder is nil, the excrescence usually smoothes out. Third, if the fistula presents near one or the other ureteral orifice, the line of closure of the bladder should be so planned as not to angulate the ureteral orifice.

The injection of the bladder with dye stuff after closure of the fistula, as recommended by many writers is, I think, useless. Some years ago I used catheterization at eight-hour intervals. Later, I adopted the Pezzer permanent catheter. Recently, I have used the sewed-in plain catheter, first, because of simplicity of removal, and second, for fear that the Pezzer catheter might make pressure necrosis along the line of closure. Drainage over the foot of the bed plus abdominal posture as recommended by Schmitz of St. Louis is an added measure of safety.

DR. W. WAYNE BABCOCK, PHILADELPHIA, PA.—Why do vesicovaginal fistulas sutured with catgut often fail to remain closed? When catgut is put in the tissues, healing does not occur at once around it, for immediately a defensive reaction is aroused. About the catgut there is swelling and exudation of serum and leucocytes,

and by the end of the third day adjacent necrosis occurs which by the end of a week has formed a distinct greenish layer around the catgut. Healing is delayed until the irritating foreign body and necrotic tissue are removed and replaced. If the catgut is near the skin, there is adjacent redness, swelling and edema. Catgut coming from the sheep and having had a high bacterial impregnation, is irritative to human beings and tends to produce an allergic reaction which is more marked in certain persons than in others. Silver wire causes no defensive or allergic reaction, it is noncapillary, does not transmit bacteria, and does not antagonize repair. Thus Sims succeeded when he adopted silver wire as a suture material.

Silver wire has certain disadvantages. It has a low tensile strength, it must be fixed by twisting, it cannot well be tied in a knot, and it may produce a disfiguring argyria. Nevertheless, it will heal in and become buried in a septic field. In recent years a so-called new noble metal, rustless alloy steel, has come into use. It may be drawn into very fine annealed wire, soft, nonirritating and strong, which can be imbedded in the tissues without reaction. It may readily be tied in a secure surgeon's knot and will heal in a septic wound without causing a sinus or discoloration. Thus we can use it to ligate vessels even in infected wounds and leave the ligatures or sutures in. I have found it, therefore, of particular advantage to do these operations without any catgut, using from a No. 36 to a 32 (B and S gauge) alloy steel wire as interrupted inverting sutures for the bladder, cutting the ends short. A second layer may be put in the vagina and the line of union staggered. We have found no calcareous deposit on wire sutures left for a year in the bladder and have even sutured the ureter, biliary ducts, and intestine with this same material. This very strong, fine, flexible wire has quite revolutionized our results in plastic operations upon mucous and contaminated surfaces.

DR. NATHAN P. SEARS, SYRACUSE, N. Y.—I was very glad to hear Dr. Phaneuf say that he has tried as many as six times in treating an occasional case before he succeeded. Often in our enthusiasm to close the fistula we give the patient the impression that it will heal the first time, and if it does not, she will not return.

I am disappointed that Dr. Phaneuf did not show any good results with the transvesical repair of fistulas. I collected 48 cases some years ago and had two successful ones of my own. The operation has been spoken of as Young's, but I prefer to give Trendelenberg credit for performing it successfully in 1883.

We make a mistake in the repair of any fistula if we do not sufficiently enlarge the opening, to get well beyond all of the scar tissue around the fistulous tract and get a good healthy tissue to bring together. Evidence of the poor healing of scar tissue is often seen in abdominal incisions, where we have had to go through an old scar, the new part of the wound will heal perfectly while, in the scarred tissue, healing will be slow and imperfect.

This paper was also discussed by Drs. Bland, Kennedy and Tovey.

DR. PHANEUF (closing).—The postoperative care of these patients is dependent upon four factors. The first is the use of the self-retaining catheter. A plain catheter may be as advantageous, but I have not tried it. Second is the placing of the patient on the abdomen, a method which I learned from one of our pioneer urologists, in order to divert the urinary flow from the suture line. I keep the patient in this position for about ten days. After a couple of days she does not seem to mind it very much. The third point is the irrigation of the bladder and the cleansing, reboiling and reinserting of the catheter should it become occluded. Finally, all these manipulations should be done by the operator himself and should not be left to a nurse in training or to a young interne.

The invagination of the fistulous tract into the bladder seems of distinct advantage in closing some of the fistulas higher up.

PREMATURE SEPARATION OF THE PLACENTA IN PRIVATE PRACTICE*

ROBERT L. DENORMANDIE, M.D., F.A.C.S., BOSTON, MASS.

THIS paper is based on an analysis of thirty cases of premature separation of the placenta, partial or complete, that I have met in private or consultation work. It is purely a clinical study. The final diagnosis was established when the inspection of the placenta after delivery showed dark, blood-infiltrated areas with blood clots adherent or when the actual separation was seen at the time the section was performed.

I have divided the cases into two groups: the first, where delivery took place by vagina, 16 cases; and the second, where a cesarean section was done, 14 cases. In the first group, except for 3 cases which I shall speak of later, all can be regarded as mild cases of partial separation. I shall discuss briefly the outstanding signs and symptoms in these 13 cases and the results obtained, and then speak of the other 3.

Only one patient in this group showed any toxemia. All were in active labor when the first suggestion of separation of the placenta occurred. Two signs of impending trouble appeared in this group at about the same time—bleeding and the absence of normal uterine relaxation. One or the other of these two signs was present in all. As the normal uterine resiliency became less, tenderness on palpation of the uterus appeared, and the patients complained of varying degrees of pain, many times when they were having no uterine contractions. In no case was there excruciating pain. In one case the patient complained of severe pain in the upper left quadrant of the uterus, but the uterus was contracting satisfactorily, and there was only a small amount of show. Marked fetal motion occurred a short while after this pain appeared, and on rupturing the membranes a large amount of blood-stained fluid came away. A version was immediately done. The baby was in pallid asphyxia but was soon resuscitated. Pain is not an outstanding symptom.

Four were primiparas and nine were multiparas. Three had quick, normal deliveries, one at full term, one at eight months, and one at six and a half months. The last two babies were stillborn. Ten of these patients were delivered as soon as the soft parts permitted.

The one patient who showed toxemia had a bag inserted; the bag was expelled and in a short while bleeding began. The uterus did not relax satisfactorily and a version was done at once, but the baby was lost.

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One patient, a primipara, started in labor with a slight amount of bleeding and complained of constant discomfort whether she was having a pain or not. I suspected a beginning separation and inserted a Voorhees bag. As soon as it was expelled I delivered her by forceps. The baby was lost. As I look back on this case, it was unquestionably badly managed. It was one of the earlier cases, and at the present time I am sure that had I done a cesarean section the patient would have had a living baby.

The uterus in several of these cases acted badly but in no case was it necessary to pack. In this series of 13 cases the mothers were all discharged well, but 4 babies were lost.

The 3 other women in this group were all multiparas. One had a toxemia of pregnancy with a blood pressure of 160/90 and the slightest possible trace of albumin. She was a large, stout woman, in labor. The uterus was hard, tense, and approximately full term in size. A steady though slight trickle of bright red blood was present by vagina. She was in good condition. Her membranes were ruptured, the vagina was packed with gauze, and a tight Spanish windlass was put on and kept tight. She was then given minim doses of pituitrin every hour for ten doses. She gradually expelled the packing and delivered herself of a stillborn baby. The placenta came away at once with many large clots, and several of the clots were adherent to it.

The second patient had no toxemia. She was in active labor, seven months advanced, and bleeding. The uterus was hard, boardlike, and tender. The same procedure was followed with this patient, and she quickly expelled a stillborn baby. The placenta came away at once with many large blood clots. Obviously she had lost considerable blood and therefore she was transfused. Her convalescence was satisfactory.

The third patient was a multipara who was seized with a sudden, sharp, excruciating pain in the abdomen. Within half an hour bleeding began. She was sent at once to the nearest hospital, and when I arrived four hours later, the uterus was tense and hard, but not especially tender. The fetal heart was not heard. Rectal examination showed the head well down in the pelvis, and the os was very soft and dilated nearly three inches. Her blood pressure was 100/50 and her pulse was 100. She was taken at once to the delivery room, her membranes were ruptured, the cervix and vagina packed, and a tight windlass put on. Within two hours she pushed the packing out of the vagina and the head was in sight. I was about to deliver her when she began to complain of severe pain in the right groin running down the leg. She suddenly gave one gasp, vomited, and died. I immediately extracted a stillborn child. The placenta came away at once with many large clots. This patient had shown no toxemia, but before the membranes were ruptured she was catheterized and the urine was found to be solid with albumin. A month before, she had had a severe mouth infection which cleared up rapidly under appropriate treatment. It is interesting to note that one other patient also had a similar severe mouth infection.

Of this group delivered by vagina, 15 of the mothers were discharged well and 1 was lost. Nine of the babies survived and 7 died. What pathology would have been found in these uteri, had they been seen, is purely surmise, and what would have been the results had the patients been allowed to go on and deliver themselves is of course debatable. There was no autopsy on the one patient that died, but I feel that she had a massive embolus.

Now turning to the group of 14 patients who had cesarean section, they were equally divided between primiparas and multiparas. Two were full term, 8 were in the eighth month, 3 in the seventh, and 1 was only six and a half months advanced in her pregnancy.

Four had a toxemia of pregnancy with the blood pressure elevated, the highest being 180/100. This patient was also blind when operated upon. All these patients had large traces of albumin and casts in the urine. One had an eclampsia. Nine showed no signs whatsoever of toxemia.

Six patients complained of absolutely no pain of any type. In 4 the pain was very slight, amounting only to a vague discomfort. Three had severe, excruciating, constant pain, and the one patient with eclampsia was comatose.

The uterus had a normal feel, and there was no bleeding in only 2 cases, and those were the ones in which a separation was found while the cesarean section was being done, but the cesarean section was not done because of the separation. In 1 patient bleeding appeared shortly after labor started, but the uterus felt normal. In only 4 patients was the uterus recorded as being of stony hardness, and three of these showed a toxemia. In 6 cases the uterus was tender on palpation and the relaxation was poor, the patients taking the palpating hands off the abdomen.

The lack of normal resiliency was the most characteristic and constant symptom which occurred in these cases. The one patient who had eclampsia was being treated conservatively. She was in labor when she began to bleed by vagina, and the uterus became rigid. It was then that the diagnosis of a separation was made and a cesarean section done.

None of these patients were in active labor, and in the ones who were examined there was no dilatation. The presenting part was low in the pelvis in 7 of the cases. In only 3 was the pulse rapid. Evidence of shock was present in only 2 cases.

The classical cesarean section was done in all these patients, and the placenta was found completely separated in 7 and partially separated in 7. In 8 there were marked ecchymoses present. In 10 cases the babies were either stillborn or died shortly after delivery. In 4 the babies lived, and in 3 of these the uterus was markedly ecchymotic.

In all these cases the patient was operated upon as soon as the operating room could be made ready. In all the cases, the mothers made a satisfactory convalescence.

In only one case was rotation of the uterus present.

This patient was supposed to be seven months advanced in her pregnancy, and she presented at least an eight months' uterus. On palpation the uterus was tender and firm. Rectal examination showed that the fornices were bulging. There was no dilatation. I did a cesarean section, but the cause of the increased size of the uterus was hydramnios and not blood as I had suspected. The placenta, however,

was partially separated, with a clot two by three inches retroplacental. This case might have been managed as well from below, for the fetus was an anencephalic monster.

There are many interesting points to be noted in this group, but there are four outstanding cases of which I want to speak further.

The first was a forty-two-year-old primipara in the last two weeks of her pregnancy. She had had a blood pressure varying from 120 to 130. She had shown no albumin and her general condition was excellent. She had had only three hours of labor when she began to have a considerable show of blood. The uterus was contracting satisfactorily, but because of her age and because she had a high presenting part, I elected to do a cesarean section at once. Upon opening the abdomen I found an ecchymosis in the midline of the uterus about the size of the palm of the hand, and on incising the uterus a blood clot presented with the placenta immediately beneath it. The placenta was about a third separated. The uterus was slow to react and my first suture in the uterus cut out, a thing which not infrequently happens in these ecchymotic uteri. The uterus acted satisfactorily before the incision was closed, and the patient made a perfectly satisfactory convalescence. The baby was also discharged well.

The second patient was eight and a half months advanced in her third pregnancy. She had had an absolutely normal pregnancy. Seven days after her last visit she had a sudden, profuse, painless hemorrhage which ran down her legs. She was sent at once to the hospital, where I met her. She was not in labor. The uterus did not have quite the normal resiliency. From my prenatal examination I knew the head was well down in the pelvis and I did not think that she had a placenta previa. She was catheterized and the urine was found to be solid with albumin. Her blood pressure was 170/100. I did a cesarean section at once. When I opened the abdomen the uterus presented typical ecchymotic spots running over to the right appendages, very little to the left, and there were ecchymotic areas on the posterior wall. The incision in the uterus bled but little, which in these cases is not uncommon. The placenta was on the anterior wall, partially off, with clots in the uterus. The baby was in marked asphyxia, but was resuscitated. The patient was transfused while on the table.

The third was a woman twenty-four years of age, eight months advanced in her second pregnancy. She had had during her pregnancy a troublesome anemia which was gradually but steadily improving. I saw her the day before, and she was then in excellent condition with a blood pressure of 104/60, no albumin was present, and she remarked that she was feeling better than she had felt before during this pregnancy. The next afternoon about two o'clock she telephoned saying that she had had slight discomfort during the night, no pain, and that for a while this discomfort would wake her up, but she had had on the whole a fair night. She was out of town, and I asked to have her local doctor see her. He telephoned me shortly after that there was no bleeding, that the uterus was a little firm, and that she was in excellent condition. I told him to send her at once to the hospital. I met her there, where she arrived in about two hours. At that time the uterus was firm and had begun to be slightly tender, but she was complaining of absolutely no pain, and she steadily denied that she had had any pain. When she arrived at the hospital there was no bleeding. She had a blood pressure of 96/58. A catheter specimen showed a heavy trace of albumin with granular and hyaline casts. I operated immediately and found ecchymoses, one to the left of the midline, and one to the right that ran nearly to the appendages. When the incision was made in the uterus the blood came out under pressure and several large clots were expelled. The placenta was completely separated and a stillborn baby was delivered. She also

was transfused on the table. In closing the uterus several sutures cut through the uterine musculature, but on taking deeper bites the uterus was satisfactorily closed and acted well. She left the operating table in good condition. She made a good convalescence and was discharged well.

The fourth patient was six and a half months pregnant, thirty-six years of age, in her fifth pregnancy. She had had one previous cesarean section, the reason for which I was never able to discover. While she was under my care she had had a very variable blood pressure, running from 160/104 down to 120/70. At times she would show the slightest possible trace of albumin but at no time did she have any casts. She began to flow steadily with bright red blood and complained of a severe, constant backache. When I saw her at the hospital the uterus was firm and tender. A rectal examination showed no dilatation, and because of the fact that she had had a previous cesarean section I elected to do another even though she was only six and a half months advanced. I found the uterus was ecchymotic in the midline at the bladder reflection, running up anteriorly, and also there was ecchymosis on the posterior wall of the uterus. The placenta was free with many large clots in the uterus. The uterus was closed in three layers and acted well. She made a satisfactory convalescence.

These two groups of cases, and especially the last, bring to mind a totally different picture from that often drawn. I agree that the signs and symptoms in some of the fulminating cases appear in quick succession. In these cases the tragedies of obstetric work appear. But I maintain that if the mortality is to be lowered in these cases the milder symptoms, which are much the more common, must be evaluated earlier and appropriate treatment instituted at once. Shock is not always present; toxemia is not always present; bleeding is not always present; pain is not always present. The condition may appear early in pregnancy, in primiparas as well as in multiparas. In others words, it may appear in any pregnant woman with most variable symptoms.

The one sign that to me is most important is the change in feel from the normal uterine resiliency. I believe that the earlier this is recognized, the better will be our results, provided there is no delay in operating. The time element in these cases is of the greatest importance. They do not tend to spontaneous cure. Watchful waiting is not justifiable, and that is why it seems to me frequent hemoglobin readings, measurements of the uterus, attempts to coagulate the blood, all are futile. The longer the delay in emptying the uterus after a separation has occurred the greater the probability that the dissociated uterine muscle will not act well and hysterectomy may be necessary. In no case was this indicated in the present series.

Frankly, I do not know the cause of this complication. Trauma played no part in these cases. I do not believe that rotation of the uterus is the cause. The usual toxemia of pregnancy and eclampsia may be present, but some other toxic condition of unknown origin is to me the more likely cause.

It would be interesting to know the further histories of all these cases, but I have not been able to follow them up. I do know, however,

that there were seventeen subsequent pregnancies in which no separations occurred, and that six of these were in patients who had had the severe type with ecchymoses present.

I admit I have been lucky in the outcome of these cases. Some of you may have as good results by treating such patients more conservatively. My object in bringing this series before you is to insist upon an early diagnosis and then individualization of the treatment. As the symptoms and signs vary, so will the treatment.

DISCUSSION

DR. JAMES R. McCORD, ATLANTA, GA.—During the past three years in our clinic there have been 4,972 deliveries at all periods of gestation. Premature separation of the placenta was diagnosed 28 times. In 3 of the 28 cases the diagnosis could not be positively differentiated from placenta previa. Antepartum vaginal hemorrhage was present in 23 cases. Albumin was found in the urine of 13 women. Hypertension was present in 20 cases. The eyegrounds of 12 women were studied; pathology was found in 5. A tight, irritable uterus was definitely described in 20 cases; in 8 cases it was not mentioned. Eight women were primiparas.

The 28 cases were arbitrarily divided as mild (11), moderate (11), and severe (6). Eleven women were at term. There were 10 babies born alive. These babies were delivered from the mild and moderate cases. Several of the babies were premature and their ultimate survival is doubtful. Twenty-six of the patients were treated expectantly. The membranes were ruptured 14 times as a method of treatment. A forceps operation was done on one woman and a breech extraction upon another. Abdominal delivery was not resorted to, nor was the vagina tamponed.

Two women died. In one the premature separation was complicated by eclampsia. The other patient refused an induction of labor two weeks earlier, signed a release, and left the hospital. She was readmitted with a premature separation of the placenta. Her death seemed to be caused by a congestive heart failure, and she died undelivered. Blood transfusion was done only three times. There is great difficulty in getting negro donors.

Premature separation of the placenta is often the most serious of obstetric complications, and in severe cases the maternal mortality will probably remain high. Radical treatment in experienced hands, coordinated with good judgment, will save the occasional case. However, it is my opinion that widespread dissemination of radical procedures in the treatment of this condition will do more harm than good. It would seem probable that the average patient, in average hands, should be treated along expectant lines—rupture of the membranes, vaginal tamponade, the treatment of shock and artificial delivery done only when imperative.

DR. ARTHUR H. BILL, CLEVELAND, OHIO.—Our treatment, whether with partial or complete separation, is active. We recognize no palliative, watching treatment. Our routine treatment is abdominal cesarean section. Where there is partial separation and where we have recognized the separation early, we have been able sometimes to save the child.

Dr. DeNormandie's list did not include many of the more tragic cases. They furnish the real problems of obstetric practice. There has been mortality in these cases in the past, and there still is mortality, I think largely due to the treatment. The teaching has been that the only way to stop the hemorrhage is to deliver and let the uterus contract. The doctors have been so impressed with this fact that they have often resorted to delivery when the patient was in poor condition. While the method of delivery is important, yet the condition of the patient is even more important. In evaluating this the external bleeding means very little, but we must be

sure that the patient is able to stand the delivery, and she should not be delivered until she is in condition to stand it. That means that whenever there is any doubt the patient should be fortified by blood transfusions before delivery, and while on the table, and, if necessary, transfusion may be repeated afterward. The mistake is often made of delivering and transfusing afterward. Prophylactic transfusion is the secret of bringing these patients through.

As I have pointed out before, antepartum predisposes to postpartum hemorrhage. There comes a time when the uterus loses all its contractile power and will not respond to drug stimulation. If you let the patient come to that stage it is almost impossible to make the uterus contract again. There is a vicious circle; bleeding causes relaxation of the uterus, relaxation causes more bleeding, and the important thing is to anticipate that condition and not let it occur.

DR. FOSTER S. KELLOGG, BOSTON, MASS.—Statistics in placental separation are not useful to date for drawing just conclusions as to the best treatment. The inclusion of a variable number of low attached placental separations on the one hand, and "chronic nephritic" four to six months' miscarriages on the other, vitiates the statistics. Neither of these conditions plays any part in the immediate maternal mortality of premature separation of the normally implanted placenta.

For many years we accepted abdominal cesarean section as the best treatment for what others have called "tragic" cases, and it was our opinion that our results by this method were excellent. Check-up, however, showed a maternal mortality of 22 per cent by this method; subsequently it was 15 per cent in a longer series. For this reason the policy of treatment in the cases with a dead baby was changed to the Rotunda method, i.e., tight pack, Spanish windlass and normal or nearly normal delivery, abdominal section being reserved for the ones with a reasonably good fetal heart. A small series by the Rotunda method has been reported by Dr. Irving, with relatively good results.

DR. IRVING W. POTTER, BUFFALO, N. Y.—I know of no way by which one can determine the degree of detachment or how much of a detachment he will have to deal with later. Neither do I know of any way one can tell how much of a placenta will present and how much will not. For that reason I think the best results in these patients are obtained when they are treated surgically.

In the so-called tragic case, transfusion is all right in our experience for blood loss and in early shock, but in prolonged shock I have my doubts as to its value. The operation of choice in the tragic case is the Porro operation, where the uterus is taken out, the child being in the unopened uterus and then removed from the uterus on the outside. That is an operation where there is practically no blood lost, transfusion can be carried on immediately and the patient is benefited. The cesarean section followed by hysterectomy is a blood-losing procedure, and if you will go back over your histories of cesarean section you will find that many of your patients have died from a hemorrhage that has occurred after the relaxation of the uterus, even one-half to three-quarters of an hour after the patient has been removed from the operating table. With the Porro operation that does not occur. You take out the uterus, the detached placenta is in it, you transfuse the patient, and there is no postpartum blood loss.

DR. WILLIAM T. McCONNELL, LOUISVILLE, KY.—Careful examination of all placentas shows us that there are a great many partial separations which give no symptoms and are only diagnosed at delivery. I agree with Dr. DeNormandie that premature separation is not necessarily due to toxemia of the patient, but to a pathologic condition of that individual placenta. The tonic uterine contraction that we find is not due to distention with blood or fluid, but to an effort on Nature's part to stop the bleeding by a tonic contraction, and therefore gives no indication of the amount of blood that has been lost already.

Many of these babies are born alive but the great danger to them is atelectasis, interference with the blood supply because of the pathologic condition of the placenta. We have adopted the method of administering carbon dioxide upon birth, giving complete aeration of the lungs. I believe in that way many babies can be saved.

DR. THADDEUS L. MONTGOMERY, PHILADELPHIA, PA.—In a study of the cases of premature separation of the placenta which occurred in our clinic at the Jefferson Medical College Hospital, I found that there were three etiologic factors present. The most conspicuous of these was toxemia, found in over 50 per cent of all the cases, and in 85 per cent of those which occurred before the onset of labor. The second etiologic factor was trauma. In one or two instances severe blows upon the abdomen were apparently responsible for placental detachment. The third etiologic factor was trauma in delivery, such as the partial separating of the placenta during the performance of internal podalic version, or extraction of the first baby in twins.

In many cases it is difficult to differentiate between marginal types of placenta previa and premature separation of the placenta. In the case of a low implantation of the placenta slight separation may occur as labor is inaugurated. The blood may accumulate between the placenta and the uterine wall, invade the uterine wall, and produce muscular spasm and hypertonicity, giving rise to a picture which resembles closely that of premature separation of the placenta. Upon careful examination of our history records, I found many instances in which this type of case occurred, and I felt at the time that they should be considered as instances of placenta previa.

It has been my experience that the frank case of placental detachment which occurs in instances of nephritic toxemia, which may appear at any time during the latter half of pregnancy, is best treated by abdominal cesarean section, unless the mass of the products of conception is so small and the cervix so easily dilated that one can rationally wait for, or consummate, delivery by the vaginal route.

Two points must be kept in mind if one is to perform cesarean section: namely that the patient must be prepared by intravenous instillation of fluid, either glucose or, better, blood transfusion, and that the operation itself is most safely done under local anesthesia, so that the already existing shock is not added to. Our mortality in this condition is one maternal death in some 25 cases. Of course, the fetal mortality is always, and will always be, very high.

DR. DENORMANDIE (closing).—It is interesting that no one here has spoken of manual dilatation in delivery of these cases. When I first recognized this condition, it was the routine treatment, and if we have given it up, it is a tremendous gain. In the hands of the general man without hospital facilities the conservative treatment is the best method, but when you have opened these patients and seen ecchymotic uteri you cannot be convinced that it is proper to wait and treat them routinely from below. I do not agree with Dr. Bill that transfusion should be done before delivery, and it was not done in any of my patients. Three of them were transfused on the table. All were ready to be transfused if necessary.

There was a question as to whether some of these cases were low attached placentas or not. I could not say absolutely but I do not think they were. They were all operative deliveries except three, and I did not feel the placenta in the lower segment in any of them.

What I particularly wished to stress is the individualization of the case, but not waiting and doing nothing. Treatment should be started at once—rupture of the membranes, a Spanish windlass, or some other measure. I do not think delay is justifiable.

INTERMEDIATE REPAIR OF INJURIES RESULTING FROM CHILDBIRTH*

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(From the Stetson Hospital)

GESTATION, labor, and the puerperium are termed physiologic processes. Although this is undoubtedly true in a certain percentage of cases, nevertheless, there are many women who develop complications during these periods which demand serious consideration. The vast majority of primiparas, and a goodly percentage of multiparas, are lacerated to a greater or lesser extent during labor. The repair of these lacerations is the topic for discussion in this presentation.

It is claimed that a laceration in some part of the birth canal occurs in every primipara during delivery. This statement on the surface would seem to be an exaggeration. However, in a careful study in a postpuerperal clinic of patients in whom there had been chiefly spontaneous deliveries with a minimum of interference, perineal lacerations, either recent or old, were encountered in 63 per cent, and lacerations of the cervix uteri in over 90 per cent.

It is unanimously agreed that if the patient is to be symptom-free, lacerated tissues in any part of the birth canal should be repaired. It follows, therefore, that every injury to the birth canal must be repaired before the patient is discharged from the hospital. Unfortunately, only a small percentage of the patients are afforded such treatment. To do this repair work successfully, one must not only be familiar with the normal pelvic structures, but also must understand the mechanism by which these injuries are inflicted. A sound obstetric experience is a necessary prerequisite if one may hope to secure the best results from pelvic plastic surgery.

During labor the damage from the presenting part may be limited to the anterior segment of the pelvic floor. As the head descends, the bladder and anterior wall of the vagina are pushed downward so that the strong fibrous tissues may be separated, producing a relaxation which in many cases is followed by a cystocele or an urethrocele.

When the pressure of the descending head is inflicted on the tissues in the posterior segment of the pelvic floor, there may result a submucous separation of the deeper structures. Such injuries are fre-

*Read at the Forty-Eighth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons held at Skytop, Pa., September 16 to 18, 1935.

quently unrecognized at the time of delivery, and only later is a relaxation of the pelvic floor noted. In other cases there is a frank laceration which extends only through the fourchet and the introitus vaginae, or the tissues may be divided down to the sphincter ani muscle, with damage to the transversus perinei muscles and the deep pelvic fascia. In more severe injuries the laceration may extend through the sphincter ani muscle and up the rectum for several centimeters. If the laceration in the midline extends up one or both sulci, through the levator ani muscles, the rectovesical and the ischiorectal fasciae, the support of the perineal floor is decidedly impaired, with a resulting rectocele. The damage to these structures may be low down at the side of the rectum or at the attachment to the white line, or on any plane between these points.

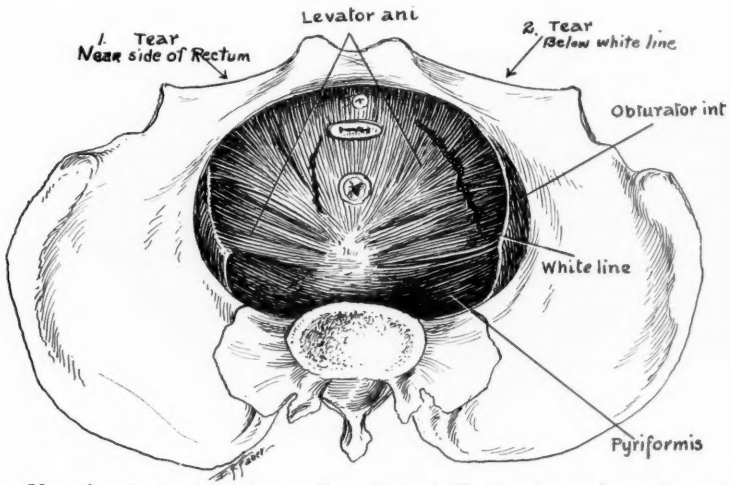

Fig. 1.—Muscular floor of pelvis. *1*, Tear through the levator ani muscle near side of rectum. *2*, Tear through the levator ani muscle below the white line.

If the uterus in these cases is in the direct plane of the pelvis and freely movable, a prolapse of this organ will develop in many instances.

The chief supports of the pelvic floor are the levator ani muscles, the rectovesical and the ischiorectal fasciae, supplemented by the transversus perinei muscles and the deep pelvic fascia. A patient may have, for many years, a laceration in the midline of the perineum down to the sphincter ani and up the rectum several centimeters, without a symptom from loss of support, due to the fact that the levator ani muscles and their fasciae have not been injured.

In many cases it is impossible immediately after delivery to determine whether a laceration of the cervix uteri is present and its extent. If present, its repair is not especially easy. For this reason most obstetricians are content to place a few stitches in a plainly visible midline laceration of the perineum, and leave other injuries to the tender mercies of nature.

Such a procedure will restore the genital canal to a normal condition in but a small percentage of patients. If immediate repair of the cervix and perineum is attempted, it is difficult to evaluate the full extent of the injury.

If those who favor immediate repair will, for the time being, disregard the visible perineal lacerations and examine the patients from five to seven days after delivery, they will be surprised to note how many have lacerations of the cervix uteri with no evidence of spontaneous union; that many lacerations of the perineum which at the time of delivery seemed simple and superficial, are in reality deep and

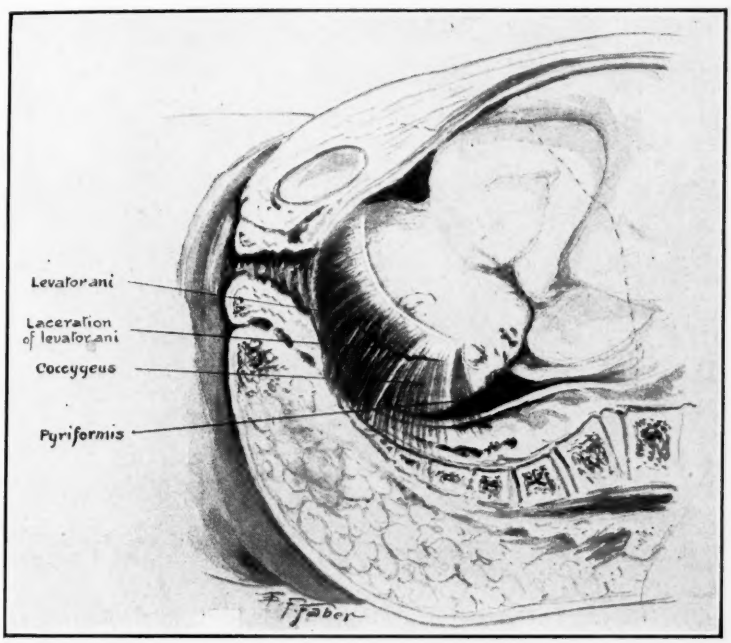

Fig. 2.—Schematic drawing of advancing head against levator and muscle with laceration of muscle.

extensive; that lacerations which were overlooked extend through the vaginal walls and levator ani muscles high up at the side of the vagina, and that submucous separation of the muscles in the perineum and of the supporting tissues under the bladder which were not suspected, exist in a considerable proportion of these women.

The ideal time to do this repair work is after the tissues have recovered from the trauma of labor, usually from five to ten days after delivery. We feel that no patient should be discharged with any of the possible enumerated lacerations to suffer discomforts from scar tissue and from loss of pelvic support, when by intermediate repair the genital canal can be restored to a normal condition, and the patient en-

joy the same health as before conception took place. The economic and sociologic advantage gained by these patients in one rather than two hospital sojourns, is incalculable.

Intermediate repair is not of recent origin. Alcock reported on intermediate perineal repair as far back as 1820. Many years ago, B. C. Hirst recommended intermediate repairs of all injuries resulting from childbirth.

The advantages of intermediate repair of these lacerations are manifold. The true extent of the damage to the pelvic structures can be

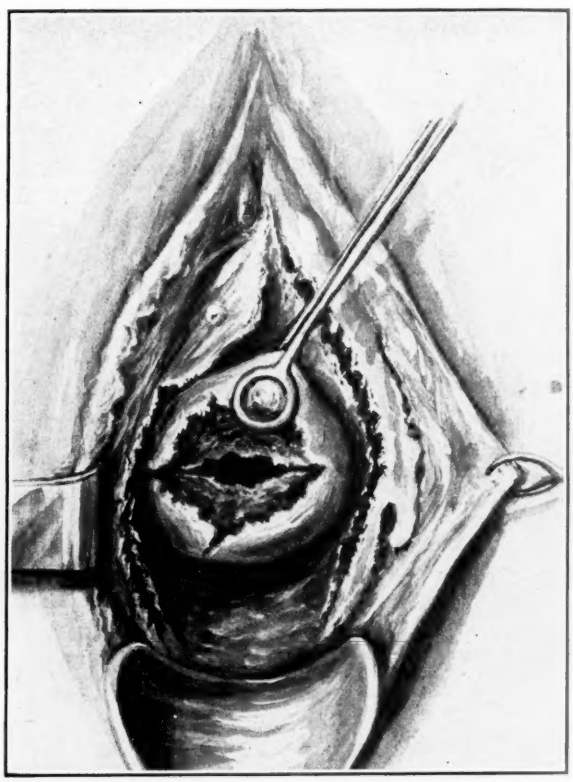

Fig. 3.—Laceration of cervix uteri, and laceration along both sides of vulva.

determined more accurately at this time; all lacerations wherever located can be sutured and the result of the operation on the perineum will be decidedly better than after the immediate operation.

If the patient has had a normal convalescence, intermediate repair is usually performed on the fifth day. In the presence of morbidity the operation is not attempted. The day before the operation the bowels are emptied well by a cathartic, and on the day of the operation by an enema. The patient is given no breakfast in the morning. She nurses her baby that morning as usual. Ethylene gas is preferred as

it does not interfere with lactation. After the patient is anesthetized the preparation of the pelvic field is the same as for a secondary operation.

In doing intermediate repairs no predetermined operation can be carried out. The damaged structures wherever located are repaired; the object being complete restoration of the parts to a normal condition.

TECHNIC

The first procedure is to dilate the cervix uteri. Any retained detritus is removed with long loop forceps, and the endometrial cavity is dried with gauze. It

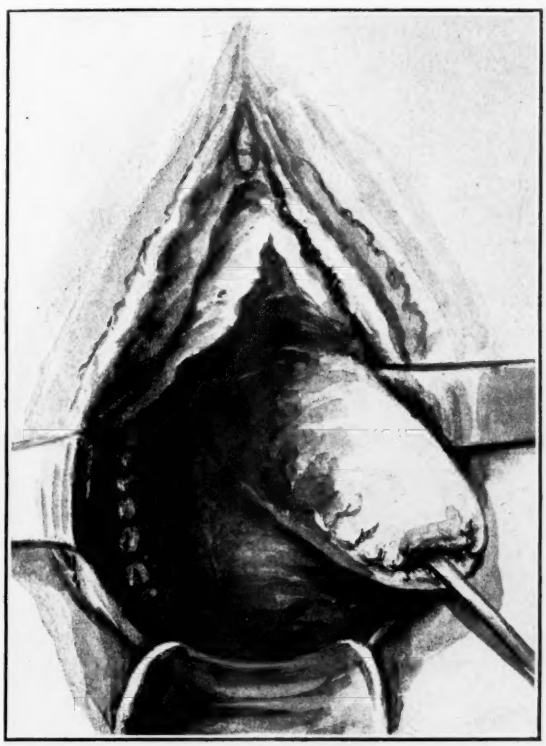

Fig. 4.—Laceration of cervix and laceration through the levator ani muscle below the white line have been repaired.

is surprising how frequently a portion of membrane or a retained piece of placental tissue is found, which is one explanation of vaginal bleeding for several weeks after delivery.

The irregular edges of the cervical laceration are then trimmed and the granulation tissues removed. Interrupted chronic catgut sutures are introduced with a noncutting edge needle. A generous os, at least 1.5 cm. should be provided to allow for involution. Following this any damage to the anterior vaginal wall is repaired as in a secondary operation. The tissues are approximated with interrupted sutures.

The irregular edges of the wounds in the vaginal canal and in the perineum are then trimmed, and the granulation tissue scraped away so that the surfaces will

be fresh and healthy. The wounds are then accurately approximated with interrupted sutures. Below the level of the hymen the tissues in the perineum are approximated by two layers of interrupted sutures.

It is most important to close the upper angles of the wounds so that the tissues will not be undermined by the lochia. The sutures should not be drawn tighter

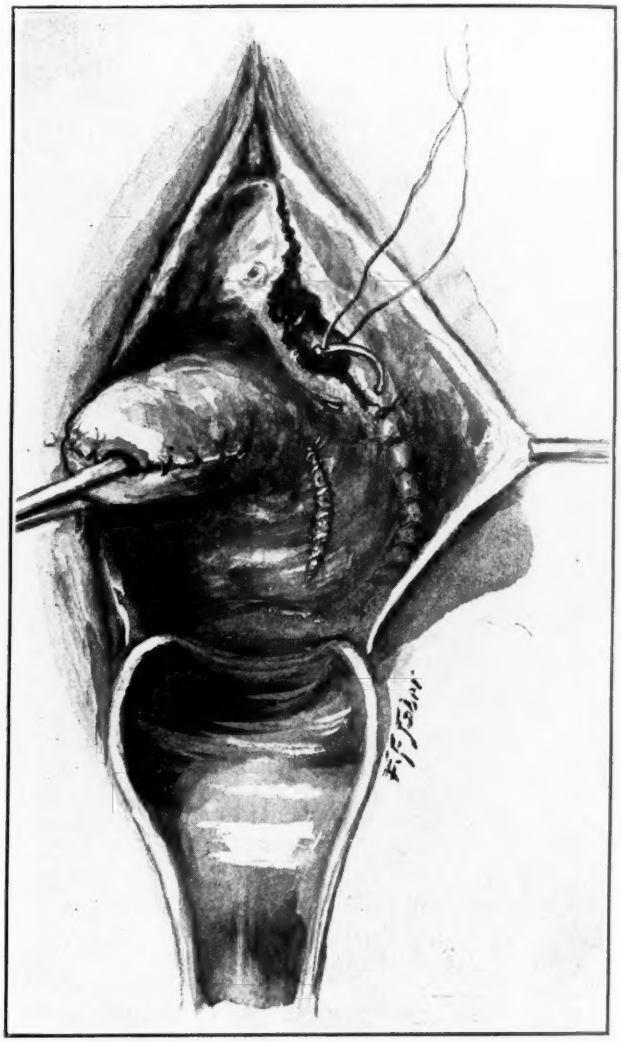

Fig. 5.—Laceration at side of rectum has been repaired: superficial laceration at side of vulva being sutured.

than is sufficient to coapt the tissues. If, in addition, the tight abdominal binder is discarded twenty-four hours after delivery, and the necessary prophylactic measures used, such as the genupectoral position and exercises, including the monkey trot and the mule kick, the incidence of retrodisplacement of the uterus will be decidedly reduced, there will be fewer subsequent operations, and we will have healthier and happier mothers.

Until the value of intermediate repairs is recognized, gynecologists will be busy repairing old lacerations which were neglected and failures following immediate repairs.

The intermediate repair of all lacerations following labor has been performed on 744 cases. Some of the patients have had intermediate repairs on four successive occasions. In no case has there been any dystocia subsequently from scar tissue in the cervix. The possibility

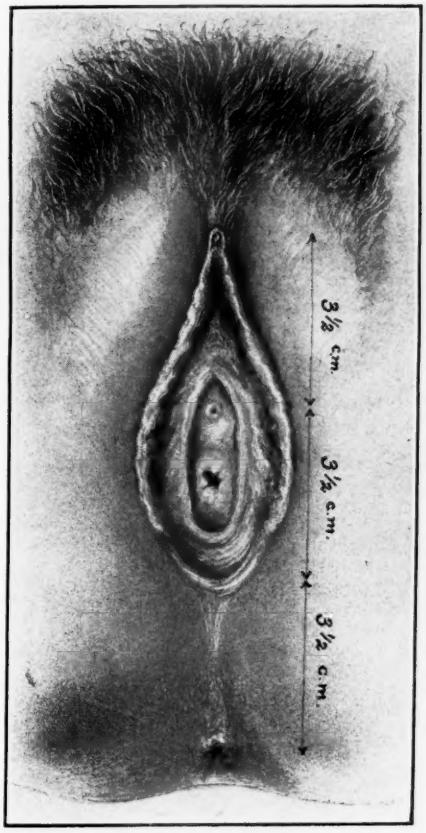

Fig. 6.—Normal perineum with scale from anus to fourchet, fourchet to urinary meatus, and urinary meatus to clitoris.

of lacerations in subsequent deliveries is about the same as in any woman with a normal birth canal.

The morbidity is approximately the same as in other surgical work. We have had no mortality.

This method is not for the general practitioner doing obstetrics in homes with unfavorable surroundings. It is an institutional procedure, but can be carried out successfully in private homes in which the surroundings are satisfactory, where the necessary equipment is available and where a trained nurse is in charge of the patient.

The greatest benefit derived from intermediate repair is probably the restoration of the cervix uteri to a normal condition. It is well known that the frequency of carcinoma is increasing at the rate of more than 2 per cent a year, that carcinoma of the cervix uteri is developing each year in women of younger age, and that the cervix uteri is a favorable nidus for the development of carcinoma. When an intermediate repair is performed, the cervix is always restored to a healthy condition, and the patient is discharged from the hospital with a normal organ. Statistics apparently show that carcinoma of the cervix uteri seldom develops in a cervix which has been repaired, amputated, or thoroughly cauterized. Intermediate repair is, therefore, the best prophylactic measure at our disposal for carcinoma of the cervix uteri.

CONCLUSIONS

1. Nearly every patient is lacerated in some part of the birth canal during labor.

2. All lacerations wherever located should be repaired before the patient is discharged from the hospital.

3. The most satisfactory time to do the repair work is from five to ten days after delivery, at which time the birth canal can be restored to a normal condition. As a result, the patient will enjoy, as far as the pelvis is concerned, the same good health as before gestation took place.

4. In 744 intermediate repairs there has been no undue morbidity, and no mortality.

REFERENCES

Alcock, Thomas: London Med. & Phys. J. 44: 193, 1820. *Hirst, Barton Cook:* Am. J. Obst. & Dis. Women & Children 75: 752, 1917.

1930 CHESTNUT STREET

DISCUSSION

DR. IRVING W. POTTER, BUFFALO, N. Y.—I agree with Dr. Tracy in the points that he has brought out with regard to intermediate repair. In 1927 I read a paper before this Association on immediate repair and I am inclined to think that the immediate repair is more satisfactory.

The injuries to the birth canal may be divided into two classes; first, those in the lower uterine segment. Those injuries, in my opinion, are not due to the surgeon unless he has manually dilated the cervix and the lower uterine segment, or unless he has applied forceps when the lower uterine segment is not obliterated or dilated, or unless he has attempted version and extraction with an undilated os. The injuries in that locality which we found were the greatest on the side of the occiput. As to the lower birth canal, we have formulated a plan of preparing the patient for delivery. Immediately before delivery her bladder is emptied, no matter whether she has voided or been catheterized on the outside. We do that to prevent detachment of the bladder from its pivotal points of attachment. Then the posterior vaginal wall is protected by a careful ironing out of the vaginal canal until all resistance is overcome. In this way we have been spared the necessity of doing episiotomies and have had less damage to the canal.

When you have pulled the segment down and looked at it, you will be surprised at its condition. It looks like a plowed field. In women past forty who have had an old cervicitis and a vaginal discharge for years and have to work, we curette that lower segment down pretty thoroughly, removing all the surrounding edges. With a continuous suture rather than an interrupted suture the edges are drawn together on both sides, leaving the os big enough to put in a pair of sponge forceps.

The immediate repair does away with a secondary anesthesia and has been very satisfactory in our hands.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—Viewed from the standpoint of cell biology, intermediate repair is not as good as immediate repair. Malposition of cells, if maintained for a period of over twenty-four hours, has certain liabilities. Repair processes proceed more slowly after an intermediate repair than after an immediate one. It is the natural biologic procedure to institute an immediate repair no matter where the injury may occur.

Bacteriologically also the degree of liability increases after the immediate period is passed.

Another point: stimulation of plasma cells and of fibroblastic cells begins and is carried on much more actively after the first twenty-four-hour period is past. By doing an immediate repair, then, one should expect less laying down of these materials that are used for repair purposes and excessive formation of scar tissue can be avoided.

Now how can one ascertain the degree of separation of tissues after delivery unless he makes a thorough examination? If that is done, every tear can be found, and it can be repaired at the same time. Recommendation of an intermediate repair admits that considerable damage has been done ,which is not good for the psychology of the patient. I have seen three autopsies resulting from tears that were not detected as the obstetricians were not in the habit of making a thorough examination after delivery. In two of these autopsies the tear and the bleeding vessel were easily recognized. If immediate repair had been done, these three lives would have been saved.

DR. B. G. HAMILTON, KANSAS CITY, MO.—In the last two years at the Kansas City General Hospital we have been able to separate Gynecology from Surgery, but unfortunately to date we have had only junior internes on service. This has necessitated delaying pelvic repairs. Only 18 per cent interference was done in 1,000 cases and episiotomies cannot be performed without permission of the staff attendant. The patient suffers more pain, has more edema and seldom is without temperature of 100.4° or more for the first two or three days. We now feel that involution is delayed and that the stay in the hospital is prolonged. In several cases there was an increase in the leucocytosis and one case was fatal, whether due to the delayed repair or not, I cannot say. However, we agree with Dr. Davis that the reparative process is interfered with and that we prefer primary rather than delayed repair.

DR. A. J. RONGY, NEW YORK, N. Y.—The success or the failure of immediate repair of pelvic injuries following childbirth does not entirely depend upon the type of operation which is performed. The relaxation of the vaginal vault and the displacements of the bladder and rectum to a large degree depend upon to what extent the "fixed point" in the pelvis is injured.

E. K. Roberts has recently pointed out that there is a fixed point in the pelvis, situated just above the internal os. It is chiefly made up of connective tissue, radiating in every direction from the uterus to the pelvic bones, and it is these tissues that hold the uterus, bladder, and rectum in their places. If for some reason during labor, especially in cases of severe dystocia, these supporting structures are injured or lacerated, the pelvic viscera will become dislocated. In such cases no op-

eration, whether immediate or intermediate, is likely to be successful, unless it is dealt with in a different manner than that followed in the ordinary repair of the relaxed or lacerated perineum.

However, when that fixed point is not injured but only the lower part of the vaginal vault is damaged, any of the classical operations for the repair of the perineum or of a cystocele will suffice.

We have no method, so far, of ascertaining immediately following the birth of a child how extensively the fixed point in the pelvis has been injured. Therefore, in simple cases of pelvic injury, immediate repair will be successful, while in the more extensive lacerations it is not likely to be successful.

DR. TRACY (closing).—In many cases, immediately after delivery it is impossible to determine the extent of the damage, and this is one reason why the results from intermediate repair are much superior.

In the spring of 1935, Nugent presented before the Obstetrical Society of Philadelphia a paper entitled "The Primiparous Perineum After Forceps Delivery. A Follow-Up Comparison on Results With and Without Episiotomy." Over 200 patients were followed up and analyzed carefully as to the condition of the perineum. As a result of this observation the statement was made: "There are some patients who deliver without episiotomy and without lacerations, but when they come in six or eight weeks later, they do not have the same perineum. This series emphasized the importance of submucous lacerations and the difficulty of recognizing and correcting them at the time of delivery." Any obstetrician who checks his results a few weeks after delivery will find that a certain percentage of his patients are in a condition similar to that found by Nugent. With intermediate repairs these failures can be avoided.

MUCOCELE OF THE VERMIFORM APPENDIX*

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MUCOID distention of the vermiform appendix is an unusual but not rare pathologic condition, and in the absence of pronounced enlargement is only of academic interest. Virchow[23] recognized and described it in 1863. In many instances, however, the confined accumulation of mucus is responsible for a gigantic tumefaction which leads to an erroneous diagnosis. Even a large mucocele may cause few symptoms until rupture follows the intolerable intrinsic pressure.

In the *Practical Surgery of the Joseph Price Hospital,* Kennedy[11] describes and illustrates three specimens of enormous size, which he terms "mucoid-appendix." In the first one, the proximal third of the appendix had been, so to speak, swallowed by the cecum, or there had been an introsusception of the proximal one-third of the appendix into the colon. Each of the other two specimens was of mammoth proportions, one measuring eight inches in length and eight inches in circumference. Both patients had had discomfort in the right lower abdominal quadrant for many years before developing acute symptoms, and the appendix was found ruptured at laparotomy in both instances. One specimen extended up toward the kidney and

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paralleled the ascending colon, whereas the other was in alignment with the cecum. Kennedy frankly confesses that upon opening the peritoneal cavity in each case he at first mistook the big mass for a malignant tumor of the cecum.

More than two hundred cases of mucocele of the appendix have been reported in the literature, several of them within the past ten years. There is no doubt that a great many others have never been placed on record, or have passed unrecognized. Squires[20] and Hall[7] have each described cases in addition to Kennedy's, in which the mucocele was found invaginated into the cecum. Easton[4] had a patient who was operated upon for typical acute appendiceal symptoms, and whose specimen yielded a giant mucocele, plus definite evidence of acute appendicitis. Topping[21] had a case of carcinoma of the appendix with an incidental large mucocele.

In a series of 8,457 appendectomies in a ten-year period at the New York Post-Graduate Hospital, a mucocele was found 8 times, an incidence of almost 0.1 per cent. Seven of the eight patients were women past middle life. In one of these cases the appendix was fusiform in

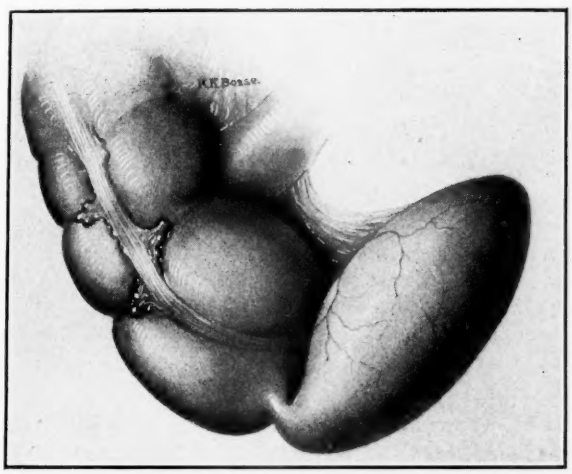

Fig. 1.—Large fusiform mucocele of the appendix, nonadherent but angulated at its base.

shape and greatly enlarged, measuring 80 mm. in length (Fig. 1). The patient was a woman of forty-nine years, who had complained of dull pain in the right side, both upper and lower quadrants, for many years. An enlarged gallbladder, as well as the appendix, was removed at operation. The distended appendix was kinked at an angle of 60 degrees at its base and constricted at its cecal attachment. The distended portion was translucent and filled with grayish yellow gelatinous mucus under high tension. The lumen appeared to have been completely blocked at its base. Sections of the wall of the appendix revealed no recognizable lining epithelium. The wall consisted of thinned muscle and fibrous tissue with an excess of round cells, and near the lumen there were small collections of mucus without epithelial cells. Another one of our cases was of such an unusual character that a detailed description is justified.

CASE REPORT

Mrs. F. Z., aged forty-nine years, presented herself on May 22, 1933. Most of the details of the family and previous personal history were irrelevant. She had menstruated at the age of fourteen, married at twenty-one, had borne 5 children, had one spontaneous abortion, and entered the menopause at forty-five years. She then developed a climacteric psychosis which cleared up after a few months. Eight weeks before coming under observation she lifted a heavy weight. This overexertion was immediately followed by pain in the lower abdomen and moderate vaginal bleeding. The hemorrhage stopped after four days, but the pelvic discomfort persisted. There were no other symptoms.

There were no significant findings in the general physical examination, and various laboratory tests revealed nothing abnormal. The vaginal walls were somewhat relaxed. The cervix was small, with a perfect epithelial covering despite a moderate laceration, showed the usual postmenopausal changes, and was located high up in the posterior vaginal fornix. The uterine corpus was found to be dislocated backward and to the left. An irregular "lumpy" mass, about the size of an orange, occupied the usual site of the uterus and practically filled the pelvis. It moved slightly with the cervix on manipulation and was apparently intrinsic in

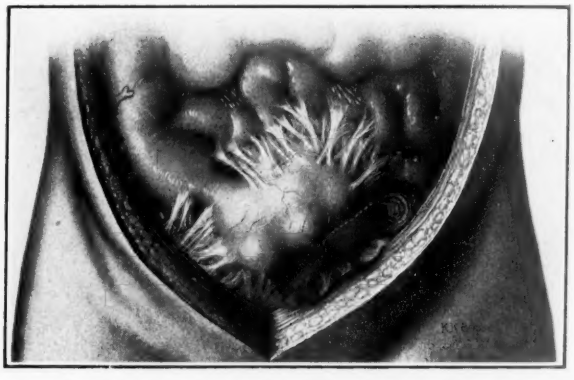

Fig. 2.—Mammoth mucocele of the appendix, almost filling the pelvis. Most of the adhesions have been omitted in the illustration, so that the anatomical relationships can be clearly seen.

or attached to the corpus, although its mobility was greatly limited. The mass was identified as either a group of small myomatous tumors originating in the right uterine wall, or a densely adherent adnexal enlargement. Normal adnexa were not palpable on either side, and in view of the negative previous history the factor responsible for the restricted mobility seemed mysterious. Since there had been no recurrence of bleeding subsequent to the overexertion, and none before it, a panhysterectomy without preliminary curettage seemed warranted.

Operation.—June 20, 1933. On opening the peritoneal cavity, a thick, nonadherent omentum was found extending down to the pelvis, which was roofed over by dense adhesions. The exploring hand, insinuated into the pelvis, discovered an irregularly distorted mass which was generally adherent. It was angulated on itself in two or three places, much like a hydrosalpinx, and felt quite hard, although it was evident that its contents were semifluid. This mass occupied practically the position of the uterus. The uterus and adnexa, however, lay deep in the pelvis behind the mass (Fig. 2) and were miniature in size. The lower margin of the cecum and ileocecal junction were closely adherent to the pathologic mass, necessitating release by sharp dissection. Mobilization of the tumefaction as a whole

was accomplished from left to right, and as the dissection progressed toward the right iliac fossa, the fatty layers of the mesoappendix were inadvertently opened. Two bleeding vessels were ligated. As the tumor mass was freed from the right adnexa, the fimbriated extremity of the tube and right ovary (no larger than an almond) could be demonstrated. On the lower margin of the head of the cecum the dissecting finger could not discover any plane of cleavage, so the broad attachment of the mass was doubly clamped and ligated. This proved to be the

Fig. 3.—Mucocele of the appendix sectioned after immersion in formalin; much of the mucus is still in situ.

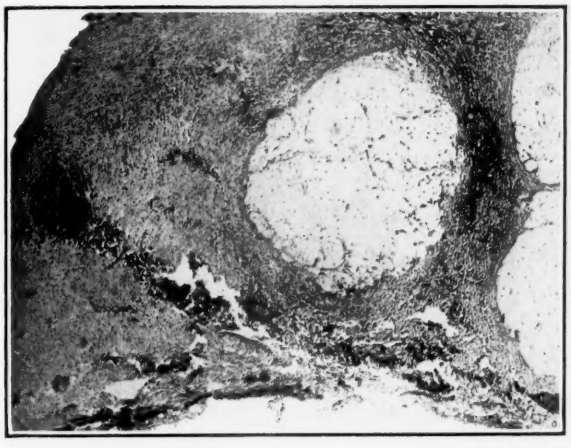

Fig. 4.—Low power photomicrograph of mucocele of the vermiform appendix showing hyaline fibrous tissue and foci of lymphocytes. There is no trace of mucosa in this area.

base of the appendix. The tumor ruptured just before its mobilization was completed, and a large amount (more than 100 c.c.) of thick, gelatinous, opaque material oozed through the small perforation. A continuous Lembert suture was used to in-fold the raw surface on the cecum. A cigaret drain was placed in the pelvis, after careful toilet of the pelvic peritoneum. The drain was removed on the second postoperative day, convalescence was uneventful, and the patient was discharged on the thirteenth day.

Pathologic Report.—Specimen measured 75 by 55 by 30 mm. (it had collapsed to a considerable degree as a result of rupture during operation). It presented an irregular, lobulated surface, formed by a thin, fibrous wall; on the outer side it was rough, gray, and hemorrhagic. There were openings through which coagulated mucus exuded. On section, it was a thin-walled, dilated sac, apparently representing the appendix (Fig. 3). The wall was densely fibrous and measured 2 to 3 mm. in thickness. The cavity was filled with coagulated mucus and partly discolored by blood. The inner wall was crossed by fibrous striae, and mucus and blood clung to it at many points. There was also about 100 c.c. of coagulated mucus which had been expressed from the appendix.

Sections through the wall at its thickest point showed one area in which the mucosa of the appendix could be recognized with its typical glands and interglandular stroma, the latter diffusely infiltrated with mononuclear cells containing old blood pigment. At other points the wall was composed of hyaline fibrous tissue in which a few muscle bundles could be recognized, and in which there were foci of lymphocytes as well as diffuse infiltration of leucocytes and mononuclear cells (Fig. 4). The latter, however, were more dense about the blood vessels. From the inner surface of the fibrous tissue wall, delicate strands of fibrous tissue extended inward and were lost in the more abundant mucous exudate. The few cells seen within the mucus or about its margin could not be recognized as epithelial cells. They were chiefly of fusiform or stellate shape; hence, the origin of the mucus was not evident. It could be due to extensive degeneration of epithelium, or it could be purely inflammatory in character.

COMMENT

The diagnostic error was due to the miniature uterus and adnexa having been displaced backward in the pelvis and covered completely by the appendiceal mass, which occupied the usual site of the uterus. The impulse of the cervical manipulation transmitted throughout the mass apparently demonstrated that the two structures were directly united. The impression of multiple small fibroids was undoubtedly due to variations in thickness and resistance in different areas of the thinned appendiceal coats. The exact size of the mucocele could not be measured, because so much mucus escaped when it was ruptured during the operation, and because of the consequent partial collapse.

ETIOLOGY AND PATHOLOGY

The terms mucocele of the appendix, mucoid appendix, residual appendicitis, retention cyst of the appendix, and hydrops of the appendix, have been used by different pathologists to designate various stages of the same pathologic process, but are not truly synonymous. There are three physical factors involved in all of these lesions: first, a slowly stenosing process with final complete obstruction at some point along the appendiceal lumen; second, retention and accumulation of the secretory products of a sterile mucous lining; and third, gradually increasing distention of the viscus, distal to the obstructed area. The condition is initiated by an occlusion of the lumen, usually close to the cecum by a mechanical, inflammatory, or carcinoid process. The stenosis occurs just beyond the cecum in most instances, so that the entire length of the

appendix is generally found enlarged, but the proximal one-third or one-half may be normal in size, if the lumen is closed that much nearer to the tip. The peritoneal coat is probably not involved in the stenosis, or gangrene would ensue. The complete stoppage of the canal prevents the egress of even the normal mucous secretion, and there is a subsequent insidious and progressive swelling of the appendix, due to a retention of its contents. Sometimes diverticula spring from the dilated walls. As the material accumulates, there is a pressure atrophy of the mucosa, with attenuation and thinning of the muscular and serous coats, with slowly increasing enlargement of the whole obstructed region. The mucocele may be sausage-shaped, fusiform, egg-shaped, nodular, or sacculated. In each of the specimens coming under our observation, it was difficult to identify areas of typical mucous membrane or to recognize muscle fibers, and no tumor elements could be detected. In most instances, the retained mucus becomes opaque and gelatinous, but in others it liquefies to some extent, and with the passing of time becomes watery. Occasionally it contains globoid bodies. In 1901 Fraenkel[6] first called attention to the fact that as a result of rupture, the contents may become implanted on the peritoneum where they cause a proliferation with formation of large masses of colloid material which are recognized as pseudomyxoma peritonei. The latter condition more often eventuates from the rupture of pseudomucinous ovarian cysts, but Ries[18] has found the rupture of an ovarian cyst and an appendiceal mucocele coexistent, and states that the appendix should always be removed and carefully examined in such cases. He reports two personal cases and refers to numerous others in the literature. Boyd[1] contends that the pseudomyxomatous masses are caused by the implantation of epithelial cells on the peritoneal surface, where they continue to produce their mucinous secretion, but this theory would presuppose the extrusion of tumor cells, which we have been unable to find. Some writers suggest that the mucoid material is potentially malignant, and is thus responsible for uncontrollable metastases when implanted on the peritoneum. However, there is no histologic evidence to prove the source of the pseudomyxomatous proliferation. At any rate, mucocele of the appendix is the only known cause of pseudomyxoma peritonei in the male, whereas it is one of two causes in the female. Since the location and extent of the cystic region depend upon the site of the obliterated point in the mucosal lumen, it seems logical to regard a large tumor of the entire appendix, filled with a homogeneous viscid material as a mucocele; to consider the same type of enlargement with a more fluid content as a hydrops; and to call a small involvement of the distal one-half or less a cyst. If the contents should become purulent, it would constitute empyema of the appendix. Boyd[1] says that a true hydrops, in which the contents are watery, is a rare condition.

SYMPTOMATOLOGY

Middle-aged and elderly women, rather than other individuals, seem to be predisposed to mucocele of the appendix. A quiescent mucocele, per se, is apparently characterized by a paucity of symptoms, except for localized discomfort or a dull pain referred to the site of the distended appendix, although some patients complain of nausea or other vague manifestations of digestive disturbance. When irritated, traumatized, or ruptured, or when adjacent structures are compromised by the impingement of the tumefaction, the patient may manifest a gastrointestinal syndrome which may simulate disease of the stomach, gallbladder, or appendix. If the mucocele becomes invaginated into the cecum, the symptoms will be those of intussusception and obstruction. Davison[3] reports a case in which the acute symptoms were nausea and hematemesis after three years of epigastric discomfort and progressive physical weakness. Diarrhea or blood in the stools occurs occasionally. As a rule, however, most patients tolerate the annoyance for several years before the prolonged discomfort becomes so distressing, or the pain is so intensified, that relief is sought.

DIAGNOSIS

A correct preoperative diagnosis is extremely difficult, because the tumor may be so situated that it cannot be palpated. On the other hand, if it is felt, its consistency, fixation, malposition, and large size may be entirely misleading. A large mucocele may be mistaken for an intraperitoneal neoplasm, especially a new growth of the cecum or an adnexal or uterine tumor. The simulation of a particular lesion is largely contingent upon the location of the mucocele and its attachment to surrounding structures. Gastrointestinal roentgenography is usually useless as a diagnostic aid, since the contrast medium cannot pass the point of obstruction and enter the overdistended viscus, although Vorhaus,[24] Simon,[19] LeWald,[12] and Lifvendahl and Ries[13] each report instances of positive roentgenographic observations. This would seem to prove that a mucocele can form without complete occlusion, or at least with intermittent patency, of the proximal end of the appendix. Even after the abdomen is open, the operator must be on guard lest he mistake the enormous enlargement of the appendix for some other pathologic condition.

TREATMENT

The treatment of mucocele of the appendix is surgical. The mass should be mobilized so far as possible by sharp dissection and every effort should be made to avoid accidental rupture. When the tumefaction is densely adherent to all the adjacent structures, as it often is, the base of the appendix should be avoided until the rest of its surface

has been freed. This will permit a cautious and safe approach to the meso-appendix, with a minimum amount of hemorrhage. If a rupture with extravasation should occur, a cigaret drain may contribute to the patient's safety, although the mucoid material is usually sterile.

CONCLUSIONS

1. Mucocele of the vermiform appendix is due to obstruction of the lumen near its base, with subsequent accumulation of mucus beyond the stenotic area.

2. Its clinical incidence is probably about 0.1 per cent. Eight cases are reported herein.

3. The gradual but persistent increase in retained material eventually produces appendiceal enlargement of mammoth proportions.

4. The intrinsic pressure destroys the mucous epithelium, thins and weakens the muscular and peritoneal coats, and predisposes to rupture either before or during operation.

5. In some cases, the retained mucus undergoes liquefaction, resulting in a cystic degeneration.

6. It is one of two known causes of pseudomyxoma peritonei.

7. It is observed most often in middle-aged or elderly women.

8. There are no pathognomonic symptoms.

9. Early clinical diagnosis is extremely difficult and roentgenographic diagnosis usually impossible.

10. Mucocele of the appendix may stimulate other pathologic conditions in the lower abdomen and pelvis.

11. The treatment is surgical.

REFERENCES

(1) *Boyd, William:* Surgical Pathology, Philadelphia, 1929, W. B. Saunders Co., p. 380. (2) *Cran, Brennan S.:* Lancet **1:** 395, 1934. (3) *Davison, Marshall:* Internat. Clin. **2:** 303, 1922. (4) *Easton, E. R.:* Med. J. & Record **138:** 463, 1933. (5) *Ewing, James:* Neoplastic Diseases, Philadelphia, 1928, W. B. Saunders Co., p. 708. (6) *Fraenkel:* München. med. Wchnschr. **24:** 1901. (7) *Hall, D. P.:* Internat. J. Med. & Surg. **47:** 169, 1934. (8) *Henke-Lubarsch:* Handbuch der Speziellen Pathologischen Anatomie und Histologie **4:** Part 3, 1929, Julius Springer, p. 531. (9) *Kaufmann, Edward:* Pathology **2:** Philadelphia, 1929, P. Blakiston's Son & Co., p. 839. (10) *Kelly, Howard A.:* Appendicitis, Philadelphia, 1909, J. B. Lippincott & Co., p. 76. (11) *Kennedy, James W.:* Practical Surgery of the Joseph Price Hospital, Philadelphia, 1926, F. A. Davis Co., p. 190. (12) *Le Wald,* quoted by Vorhaus. (13) *Lifvendahl, R. A., and Ries, Emil:* Am. J. Surg. **17:** 271, 1932. (14) *Martin, E. K.:* Brit. J. Surg. **21:** 353, 1934. (15) *Milliken, Gibbs:* Am. J. Path. **1:** 397, 1925. (16) *Myers, W. H.:* Illinois Med. J. **43:** 386, 1925. (17) *Pitts, H. H., and Gee, E. A.:* Canad. M. A. J. **28:** 266, 1933. (18) *Ries, Emil:* Surg. Gynec. Obst. **39:** 569, 1924. (19) *Simon,* quoted by Vorhaus. (20) *Squires, Charles D.:* New York State J. Med. **31:** 285, 1931. (21) *Topping, M. Hawkins:* California & West. Med. **29:** 186, 1928. (22) *Trauba, N. C.:* Wisconsin M. J. **25:** 39, 1921. (23) *Virchow:* Die krankhaften Geschwülste **1:** 250, 1863. (24) *Vorhaus, M. G.:* J. A. M. A. **94:** 165, 1930. (25) *Weaver, Don D.:* California & West. Med. **28:** 500, 1928.

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DISCUSSION

DR. CHARLES GORDON HEYD, NEW YORK CITY.—In the symptomatology and pathology there is a distinct difference between the reaction set up in the peritoneum by a cystoma of the ovary and that from a mucocele of the vermiform appendix. For the condition to arise sequential to pathologic changes in the appendix, a certain mechanism is essential. There is always occlusion of the proximal portion of the appendix, with a more or less complete destruction of the mucous membrane. In the early stages the condition is not dissimilar to a hydrops of the appendix.

The appendiceal type, however, does not produce the cystic changes which are comparable to a similar condition arising in an ovarian cyst. The pathogenesis of the appendiceal type may be considered to a large extent degenerative; whereas in the ovarian type, with or without rupture, the behavior is as a rule that of a neoplastic condition. In the latter, cellular proliferation is set up at remote distances from the original site, and metastases may occur in the abdominal wall, in any portion of the abdominal cavity, and in the lungs and subcutaneously, as in a recent case reported by Hancock. ("Pseudomyxoma Peritonei," Am. J. Surg. **28**: No. 3, 1935.)

The peritoneal changes are the result of two factors: (1) the reaction of the peritoneum, and (2) cell autogenesis. The reaction of the peritoneum is the well-known one of the exudation of mucinous material as the result of irritation of the serous membrane. The material is characterized by an intensely adhesive property, and spreads treelike in the intestinal interstices, producing marked intestinal agglutination. It is essential that the surgeon be guarded in his prognosis, for, while some patients recover after the extirpation of the primary disease, in the majority of cases this does not obtain, particularly in those that arise from ovarian cystoma.

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—The three cases of mine, which Dr. Dannreuther has referred to, were so confusing in their pathologic extensions and intimate adherent relation to surrounding structures, that I was unable to diagnose a mucocele of the appendix until late in the enucleation and dissection of these gigantic appendices from their surrounding structures. I felt I was dealing with a colloid malignancy of the ascending colon.

In these three cases the appendix was ruptured in two and a good quantity of pseudomucin was free in the abdominal cavity. It was evident that the rupture of the appendix brought the patient to the hospital. In each case there was a history of many years' right-sided symptoms, yet there was no severe pain until the rupture of the appendix.

The fatal outcome of this condition is due to rupture of the mucocele and the production of pseudomyxomatous peritonitis, an analogous condition to the papillary cystadenoma of the ovary, and is a reactionary peritonitis of progressive character. As long as the mucocele of the appendix remains unruptured, the condition is benign; when ruptured, it becomes clinically malignant.

The pathology of the mucocele of the appendix rather indicates its etiology; the great size of the organ, its occlusion at the approximal extremity, and its contents of pseudomucin pointing to a mild irritation long continued with the result of a large distended organ from an exudative process of the mucous membrane. The mucous membrane itself is atrophied and in many locations there is little evidence of epithelium, which is probably due to pressure from distention. The wall of the appendix is pearly white and fibrous, showing muscular atrophy.

It is a condition appearing late in life. My experience as to sex differs from Dr. Dannreuther, as 7 of his 8 cases reported were females, whereas 6 of the 7 cases which I have had occurred in males. I believe one-tenth of 1 per cent is a fair incidence of the mucocele of the appendix.

If one is not familiar with adhesions, it would be quite impossible to cope surgically with the average mucocele of the appendix. Four of the 7 cases which I have seen were the most trying operations I have performed within the abdominal cavity, and I was not certain until late in the delivery of the organ of the true nature of the pathologic condition.

DR. WILLIAM H. WEIR, CLEVELAND, OHIO.—A simple mucocele of the appendix owing to its weight would naturally tend to gravitate into the pelvis and might be mistaken for a cyst of the ovary. That happened in a case in which I was performing a vaginal hysterectomy. After opening the abdominal cavity this "cyst of the ovary" turned out to be a mucocele of the appendix nearly three inches in diameter. The weight of the tumor had dragged it down into the culdesac, and it was an easy matter to remove it through the vagina.

DR. FREDERICK H. FALLS, CHICAGO, ILL.—I would like to ask whether this material was tested to see if it was mucin or pseudomucin. The determination of this point in these cases might throw some light on the genesis of pseudomucin that we find in pseudomucinous ovarian cysts. If from the mucous membrane of the appendix we can get pseudomucin, it may easily be that the origin of the cells which produce a pseudomucinous cyst of the ovary is in the intestinal tract.

DR. WILLARD R. COOKE, GALVESTON, TEXAS.—We have had two of these mucoceles, of a size sufficient to be dignified by that name. One patient was a woman who came into the surgical service, the diagnosis on admission being hydronephrosis. This was eliminated by cystoscopic examination, and I was called in to eliminate the diagnosis of a cyst. It was definitely not a cyst nor was it a hydrosalpinx. I thought of a mucocele, but it was so enormous that we considered that only as a possible diagnosis. It turned out to be a very large mucocele, about the size and shape of an average hydronephrotic kidney. It was freely movable, adherent to the cecum but not to any surrounding structures.

DR. THEW WRIGHT, BUFFALO, N. Y.—The largest mucocele I have seen was in a woman eighty years of age. She had a large tumor in the right lower quadrant, was in perfect health, had gone around the world by herself a year before, and had no complaints until six months before I saw her. She had rather typical evidence of a carcinoma of the cecum, and we operated with that diagnosis. I found a mucocele of the appendix eleven inches long and about three and a half inches in diameter. She made a perfect recovery.

DR. DANNREUTHER (closing).—The material extruded from this mass was carefully gone over and both the pathologist and biologic chemist agreed that it was pseudomucin. No epithelial elements could be found.

Dogliotti, V.: A Contribution to the Study of Vulvar Tumors, Folia gynaec.-demograph. **31**: 277, 1934.

The author describes a tumor, weighing on removal 330 gm., of the left labium majus in a thirty-two-year-old woman. A very exhaustive discussion of the literature on vulvar tumors is given.

The histologic picture of the tumor in this case in some places is that of an adenoma of the sweat glands, and in other parts resembles the picture of a mammary fibroadenoma.

MARIO A. CASTALLO.

WHEAT GERM OIL (VITAMIN E) THERAPY IN OBSTETRICS*

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INTRODUCTION

EVANS and Bishop[1] in 1922 reported that rats which were maintained upon supposedly complete dietaries could not reproduce unless certain food substances were included in their rations. The animals, apart from the infertility, appeared to be normal. The females exhibited natural estrus cycles and would breed and conceive, but they failed to deliver their young on account of some disturbance which caused the intrauterine death and the subsequent resorption of the fetuses. It was observed, however, that the inclusion of whole wheat cereal, fresh lettuce leaves, or dried alfalfa in the diets of the pregnant animals permitted reproduction to occur in a normal manner. While it was evident that the sterility of these rodents was due to the absence of some essential element from their food, the condition could not be related to any of the hitherto known vitamins. Consequently Evans and Bishop[1] designated the unknown substance necessary for reproduction as the accessory food factor X. Sure[2] independently and at about the same time arrived at the same conclusions as did Evans and his coworkers, namely, that sterility could be produced in laboratory animals by certain test diets and prevented by the addition of foods which contained, presumably, the substance X. Sure[2] proposed that the newly discovered antisterility factor be named vitamin E, a term which has been universally adopted. The existence of this vitamin has been adequately confirmed by the work of numerous investigators subsequently.

It was only natural that an attempt should be made to adapt these new discoveries to human conditions. While the direct correlation of effects observed in laboratory animals with human problems may imply unwarrantable analogies, the history of the development of many accepted therapeutic measures justifies the approbation of the experimental method of approach to questions pertaining to the clinical applicability of scientific achievements. Thus the previous investigations concerning the relationship between diet and fertility in small

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animals supplied the incentive which led to a study of the possible influence of vitamin E as an aid in the correction of certain sterility problems in human subjects. At least some precedent existed in favor of the argument that the clinical exhibition of wheat germ oil, which is the greatest known source of vitamin E, should be of assistance in the restriction of antenatal mortality.

The available data relating to the clinical use of wheat germ oil, although relatively meager, are nevertheless encouraging. For example, Vogt-Möller[3, 4] in 1931 and 1933 reported favorable results due apparently to the administration of wheat germ oil, in 18 out of 21 cases of habitual abortion. Likewise, Juhász-Schäffer,[5] also in 1933, mentioned five cases of repeated abortions to whom full-term, normal, living babies were born following the use of the oil. Recently, Watson,[6] as a consequence of observations made in 65 women who were treated with wheat germ oil, concluded that vitamin E offered promise of being beneficial in the prevention of habitual abortion and probably in the treatment of threatened abortion as well. The present communication is a further report of data which have accrued as a result of the continuation of the last-mentioned investigation.

THE INVESTIGATION

As recorded elsewhere,[6] the research has been carried on through the cooperation of a number of medical practitioners who prescribed wheat germ oil to patients who presented certain reproductive difficulties. The assistance of those physicians who participated in the work by prescribing wheat germ oil and by supplying the necessary clinical records has been of inestimable value and the gratitude of the authors is hereby expressed.

To date, close to 100 patients have been treated or are being treated with wheat germ oil. Only those cases regarding whom the outcome of the treatment is certain are reported at this time. The patients have been classified into four groups as follows:

Group I: Pregnant women who had experienced two or more spontaneous abortions previous to receiving wheat germ oil treatment (habitual abortion).

Group II: Pregnant women who had experienced one spontaneous abortion previous to receiving wheat germ oil treatment.

Group III: Cases of threatened abortion.

Group IV: Women who sought medical advice on account of failure to become pregnant (sterility group).

The patients included in Groups I and II, with but two exceptions, were pregnant at the time that the treatment with wheat germ oil was started. The purpose of the treatment was to favor the continuation of the pregnancies. The patients in Group III received the oil only after

the onset of the symptoms of threatened abortion, and its administration was a part of the treatment for that condition. Those in Group IV were not pregnant at the time that the oil was used although several of these patients had been pregnant previously. The object of the treatment was to facilitate impregnation.

It should be explained that the word "abortion" as employed in this paper denotes the spontaneous premature cessation of pregnancy at any stage in its course, excluding the delivery of a viable fetus.

All the patients who received the treatment were desirous of offspring and none presented any recognizable gynecologic or other conditions which might have accounted for their reproductive failures. In the majority of the abortion and sterility cases, no therapeutic measures, except the use of wheat germ oil, were employed. But the patients with signs of threatened abortion were subjected to the usual management for that condition plus wheat germ oil.

At first the wheat germ oil was prescribed in the free liquid state, but latterly it has been supplied in a more acceptable form within soluble gelatin capsules, each of which contains 1 c.c. of the oil. For patients with a history of habitual abortions, it was suggested that the usual dosage of from 3 to 6 c.c. per day by mouth be instituted as soon as possible after the commencement of pregnancy and that its administration be persisted until well beyond the time when the abortions usually had occurred. In many instances the use of the remedy was continued until the time of labor. Patients with signs of threatened abortion received larger doses; as much as 20 c.c. of wheat germ oil has been administered in a day without ill effects.

THE OBSERVATIONS

The wheat germ oil was prescribed, as noted above, to a number of patients respecting whom spontaneous abortions, threatened abortions or involuntary sterility constituted the principal abnormalities. The present report deals with the results observed in a series of 80 women who received the treatment.

Habitual Abortion.—Of a group of 18 women who had sustained from three to 15 spontaneous abortions prior to the exhibition of wheat germ oil, 13 went to term or nearly so following the use of the oil and were delivered of healthy, living children. Ten of the patients under this regime completed a pregnancy for the first time. In one instance, a condition of accidental hemorrhage resulted in abortion and in another, the pregnancy in its early stage terminated spontaneously for no known reason twenty-five days after the commencement of the wheat germ oil therapy. One patient was a diabetic subject, but it is doubtful if the diabetes, which is said to have been well controlled at the time, was responsible for her failure to proceed with the pregnancy.

Of the 17 wheat-germ-oil-treated patients each of whom had had two spontaneous abortions, 12 gave birth to healthy, living children following the treatment. In five of the cases, however, the pregnancies were interrupted by spontaneously oc-

curring abortions, and in one of these a definite toxic state, associated with marked albuminuria, was present, which complication contributed probably to the otherwise unexpected outcome of the pregnancy. No explanation is offered for the failures in the other four cases in this group who aborted.

One Previous Abortion.—In 9 of the 11 wheat-germ-oil-treated patients, each of whom had experienced but a single previous spontaneous abortion, the birth of healthy living children ensued. In one instance, abortion took place a short time after the use of the oil was commenced and in another, miscarriage occurred in spite of adequate treatment with a preparation of wheat germ oil. It was observed that several of the patients exhibited signs of threatening abortion but with the exception of the instances noted, abortions did not follow.

Threatened Abortion.—Nineteen patients were treated for the symptoms of threatened abortion, the majority after bleeding had begun. In 13 of these, the symptoms subsided and the pregnancies continued uninterruptedly to terminate in natural deliveries, but in six cases the abortions became inevitable.

Infecundity.—Fifteen nonpregnant women were given wheat germ oil with a view to facilitating impregnation. Six of these had never conceived and therefore constituted examples of primary sterility. The remainder had been pregnant at least once, thus falling in the class of so-called secondary sterility. Eight had had one or more abortions but only two of the women had given birth to living children. Pregnancy did not ensue in any of the patients in this group.

Table I is a summary of the results observed following wheat germ oil therapy in the various abnormalities as noted. These findings are in agreement with the opinion of Vogt-Möller[4] regarding the favorable

TABLE I. SUMMARY OF RESULTS OF WHEAT GERM OIL THERAPY

GROUP	CONDITION	NO. OF CASES	SUCCESSES	FAILURES
	1. Present Series			
I	Two or more abortions (habitual abortion)	35	25	10
II	One previous abortion	11	9	2
III	Threatened abortion	19	13	6
IV	Sterility	15	0	15
	2. Vogt-Möller[3, 4] (1931 and 1933)			
I	Two or more abortions (habitual abortion)	21	18	3
II	Sterility	4	2	2
	3. Juhász-Schäffer[5] (1934)			
I	Two or more abortions (habitual abortion)	5	5	0

effects of wheat germ oil therapy, especially with reference to the prevention of habitual abortion. Moreover, judging from the records presented, it is possible that the treatment may be beneficial also in some cases of threatened abortion. The successful results in these conditions, namely habitual and threatened abortion, are in the neighborhood of 75 per cent. Incidentally, it is of interest to mention that this was the proportion of successes reported by Falls and his associates[7] in the treatment of the same abnormalities with progestin.

All of the cases of nonfertility in Group IV of the present series of cases remained barren after using wheat germ oil.

DISCUSSION

No claim is advanced that wheat germ oil is a panacea for abortions in women but circumstantial evidence points to its usefulness in a proportion of such cases, although a logical cause-and-effect relationship is difficult to establish. In the absence of decisive information concerning the factors which contribute to the normal progression of the pregnant state and the consequent lack of knowledge regarding the causation of habitual abortion, an attitude of conservatism is appropriate. Therefore, all apparent results of corrective measures must be interpreted with caution and deliberation.

Although most of the cases of threatened abortion in which vitamin E therapy was used after bleeding had begun failed to abort, it is questionable if the wheat germ oil was entirely responsible for the continuance of the pregnancies since the usual treatment for the condition was employed as well as the administration of the oil. Some allowance may rightly be made for the patients in whom the vitamin E was not administered until the manifestations of abortion were well established and the outcome therefore was inevitable. A few apparent failures are explainable, probably, by the assumption that the fetus was dead before the treatment was commenced. On the other hand, it is a recognized fact that in many cases of threatened abortion the symptoms disappear spontaneously and the pregnancy subsequently progresses to a natural termination regardless of any special form of treatment.

While considering the results observed following wheat germ oil therapy, it is of some significance perhaps to mention that during the course of the investigation here reported, wheat germ oil from three different sources of supply was used and that there is some foundation for the belief that the material from one particular source was inferior as regards its vitamin E potency as compared with that emanating from the other two sources. Thus may be explained some of the apparent failures which have been noted.

SUMMARY

The observations concerning the clinical use of wheat germ oil (vitamin E) in 80 women with various reproductive difficulties, as recorded in this paper, permit the following inferences:

1. Wheat germ oil (vitamin E) appears to be of definite value and to have its greatest scope of usefulness in the prevention of repeated spontaneous abortions (habitual abortion) for which no cause is obvious.

2. The oil may be used with advantage, also, as an adjunct in the treatment of threatened abortion if it is administered promptly and in relatively large quantities.

3. It is of no avail in the treatment of nonfertility.

REFERENCES

(1) *Evans, H. M., and Bishop, K. S.:* Science **56**: 650, 1922 and Am. J. Physiol. **63**: 396, 1922-1923. (2) *Sure, B.:* J. Biol. Chem. **58**: 693, 1923-1924. (3) *Vogt-Möller, P.:* Lancet **2**: 182, 1931. (4) *Vogt-Möller, P.:* Acta. Obst. et Gynec. Scandinav. **13**: 219, 1933. (5) *Juhász-Schäffer, A.:* Ergebn. d. inner. Med. u. Kinderh. **45**: 129, 1933. (6) *Watson, E. M.:* Canad. M. A. J., February, 1936. (7) *Krohn, L., Falls, F. H., and Lackner, J. E.:* AM. J. OBST. & GYNEC. **29**: 198, 1935.

DISCUSSION

DR. ROBERT A. ROSS, DURHAM, N. C.—Sterility and abortion in avitaminosis and certain malnutritions are notorious facts. Such a condition is found to some extent in profound diabetes, whereas persons at rest, as during tuberculosis cures, are famed for performance and fecundity. It seems safe to say that vitamin A probably has more to do with conception than E, but it is worth while to consider the whole row of vitamins in approaching this problem.

Our attention was especially directed to this phase in investigating the pellagrins in North Carolina in the hope of throwing light on our very definite pregnancy toxemia problem. We found pregnancy rare in these individuals. They had diets poor in every vitamin except E. Our conclusions indicate that several factors are responsible: the general avitaminosis, the associated general ulceration—though mild in the vaginal tract—of all the mucous membranes, the fact that most of the patients were definitely sick, and that the diet includes hog lard which in all probability is rancid.

When we read the statement in Sherman's book that "lack of vitamin A causes failure of reproduction through interfering with ovulation, whereas lack of vitamin E interferes with placental function," the above observation, in regard to sterility and the author's splendid results in abortions, is significant. And when we consider Falls' and others' series of abortions treated with progestin, there is another thought and analogy brought to light. Now that Allen has given us the formula of progestin, and Butenandt, Ruzicka and Slotta have synthetized the product—even from soy beans and coal—we may find a hook-up between these endogenous and exogenous products. This series also reminds us that there is in all likelihood a minimum which is reached, beyond which no agent is effective.

I would like to ask Dr. Tew his feeling in regard to the other vitamins, especially A, and in view of evidence that lack of E is more destructive in the male, if any measures should be taken in regard to the husband?

DR. WILLIAM B. HENDRY, TORONTO, CANADA.—The problem of sterility, threatened abortion, and neonatal death is one which presents all sorts of difficulties. It appears that it is possibly a deficiency problem. Some years ago DeLee commented upon the fact that in the Midwest there was a good deal of septic abortion, contrasting this with the condition in the Coastal States where there was none. He put it down to a deficiency of iodine and suggested the use of iodized milk in pregnancy. What his results were I have not yet heard.

Then, too, we have had Litzenberg's observations with regard to the deficiency in thyroid in connection with sterility. In the course of his remarks he reported a case of a woman who could space her pregnancies by the administration of thyroid.

Later on we had the work of Collip in connection with an anterior pituitary-like substance which is found in human placentas. This substance we have used on several occasions with the idea of continuing a pregnancy where abortion has been threatened, and it has given very favorable results. Progestin has also been used with considerable success.

The experiments of Dr. Tew, I think, are worthy of consideration because where you get 75 per cent successful treatments with regard to any therapeutic measure it is well worth considering.

DR. TEW (closing).—We do not claim that this therapy is a panacea for abortions, but we do feel that it will assist us in a certain group of the so-called habitual abortions. We tried out several companies and finally settled upon the Canada Pharmacal Company which supplied us with a fairly constant wheat germ. Taken in a tablespoon it had a very nasty taste, but we now have it made in capsule form.

What part vitamin A plays in abortion and its prevention I do not know. Vitamin E apparently offers us no assistance in so-called primary sterility. We had no help in any way in such cases.

CARCINOMA OF THE RETAINED CERVIX OR SUBTOTAL VS. TOTAL HYSTERECTOMY*

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THE purpose of this paper is to discuss the incidence and nature of cancer appearing in the retained cervix following supravaginal hysterectomy and to add a few interesting facts to the arguments of the advocates of total or of subtotal hysterectomy. The study itself revealed an amazing lack of understanding of the meaning of total or panhysterectomy, and of subtotal or supravaginal hysterectomy. Total or panhysterectomy should mean removal of the entire uterus, the fundus, body, and *cervix*. To remove the fundus and body and both tubes and ovaries and leave the cervix is not to do a total or panhysterectomy. These facts are not universally known or remembered and for that reason a questionnaire asking specifically whether the cervix was removed or not in a given hysterectomy was necessary before any accurate figures could be obtained. When this fact was established there was a great reduction in the total number of cases discovered.

MATERIAL

The material consists of 80 cases listed as carcinoma of the cervical stump or retained cervix obtained from the records of the Massachusetts General Hospital from June, 1900 to June, 1933 and from the Massachusetts State Cancer Hospital at Pondville from its opening in June, 1927 to June, 1933. During this time there had been in those two hospitals 1,218 cases of carcinoma of the cervix. Early in the study it was clear that many of the cases fell into different categories. After a careful operative description was obtained it was found that 22 cases called carcinoma of the retained cervix were really recurrences in the vaginal vault following total or panhysterectomy. In another group of 23 cases it was evident that the cancer had been present at the time of the original operation, for the patient had been treated for it within a year or less from the first operation. Surely these cases could not be classified as true cancers of the retained cervix. In still another group of 9 cases it was found that the original operation had been done for adenocarcinoma of the body of the uterus and that the appearance of cancer in the stump was a recurrence of the original adenocarcinoma. These cases were placed in a separate

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group. Of the total number of cases then but 26 real cancers of the cervical stump remained. The study was illuminating and showed clearly the necessity for a careful investigation into all the possible facts in the study of cervical stump cancer.

CARCINOMA OF THE CERVIX PRESENT AT THE TIME OF THE HYSTERECTOMY

The first group to be considered was composed of those cases in which the cancer occurred within a year of the original operation. There were 23 such cases. There were 13 in which the symptoms which led to the first operation were continuous but the discovery and treatment of the cervix was immediate in only five. In the other cases the tumor was treated within six months in 10, and between seven months and one year in 8. It was surprising to note that in three cases in which the tumor was present at the first operation and the pathologic report positive, treatment of the stump cancer was delayed for a year. Seven, or 30.4 per cent, were nulliparous, and 8 had had but one child or none. In 12 cases fibroids were present, and it was assumed that the operation was done to remove the fibroid tumor and that the cervical condition was overlooked. In only four was the combination of no children and fibroids present. Here the surgeon probably considered that because the patient had no children and because there was a fibroid, cancer was not present. Eight cases had passed the menopause, and this is another possible reason for not discovering the cervical cancer in the presence of fibroids, as the bleeding was erroneously considered in all probability as due to them.

ADENOCARCINOMA FOLLOWING SUBTOTAL HYSTERECTOMY FOR ADENOCARCINOMA OF THE BODY OF THE UTERUS

The second group to be discussed is that of adenocarcinoma of the body of the uterus with later recurrence of the disease in the retained cervix. *This group of 9 cases stands as a monument to a surgical procedure that cannot be too severely condemned.* It is common knowledge, or should be, that there is a chain of lymphatics running from the body to the cervix in the wall of the uterus and that body cancers do grow into the endocervix by direct continuity. Six of these patients were single and of the 3 others 2 had but 1 child, and 1 had had 1 miscarriage. In 2 the symptoms for which the operation was done were continuous and in one the symptoms recurred within weeks, in 2 others within months, and in 4, within years. One of these later cases did not have a recurrence of the tumor for six years. Four of these recurrent cases were regarded as favorable and 5 as unfavorable for treatment. One patient who had an adenoacanthoma is living with disease ten years after the original operation without any treatment of the cervical stump recurrence, although it has been known to be present for four years. Another with adenocarcinoma is living with disease for four years and three months following radium in the cervical stump. In 2 instances patients

developed fistulas before death. This group of cases should be a warning to any one who attempts supravaginal hysterectomy as an operation for the cure of adenocarcinoma of the body of the uterus.

REAL CARCINOMA OF THE RETAINED CERVIX

The third and most interesting group of cases are the tumors of the retained cervix that developed at least a year after the removal of the body of the uterus. These are not great in number, and it is surprising to note how few they are compared to the great number of cancers of the cervix seen in these two institutions. Of 1,218 cancers of the cervix seen, but 26, or 2.1 per cent, were true stump cancers. Thirteen of these cases were found in the records of the Massachusetts General Hospital and 13 at Pondville. In 8 cases the original supravaginal hysterectomy had been done at the Massachusetts General Hospital. An analysis of the cases shows that 6, or 23.07 per cent, were single or had no children, and that 12, nearly one-half, had had none or but one child. These cases then as a whole did not fall into a group with frequently traumatized cervices. Twenty-three plus per cent of nonfertility is considerably higher than the usual percentage of nullipara developing cervical cancer. Fifteen, or 61.05 per cent, or more than half of the patients, were operated upon for fibroids and later developed cervical stump cancer. There were four nulliparas and 5 patients with but 1 child that had fibroids. It is interesting to speculate why there should be such a large percentage of nulliparas and such a large number of patients with fibroids developing cancer of the cervical stump. Perhaps it is because the patient being nulliparous the cervix was neglected and not carefully inspected at the time of the original operation and perhaps fibroids dominate the picture, since the commonest cause for hysterectomy is fibroids. There is no question but what the great majority of patients with cancer of the cervical stump have been operated upon for fibroids. However, it may be that the uterus of these patients (three of the nulliparas were married) was abnormal. The presence of fibroids and sterility or the presence of fibroids even in multiparas usually indicates a hypoplastic type of uterus. It is possible that the cervical stump of such a uterus does not have a normal defense against cancer-forming factors. Certainly here is material for speculation. The age distribution was about as usual for cervical cancer: 2 in the third, 10 in the fourth, 9 in the fifth, and 5 in the sixth decade. One patient had a cauterization of the cervix one year before the original operation and another six years previously, and 2 had the endocervix cauterized at the time of the hysterectomy. One patient had a repair of the cervix some time previous to her operation. These cases show that cauterization or repair is not an absolute safeguard against the development of this tumor. Coning out the endocervix from above, a method of prevention of cancer of the retained cervix practiced by many surgeons, is not

sufficient. It does remove the endocervix but leaves the more dangerous squamous part of the cervical epithelium and frequently the most dangerous area, that of the junction of the squamous portion with the glandular endocervical portion. No figures are available to substantiate or condemn the method but as an absolute preventive knowledge of what is left behind seems sufficient proof of its ineffectiveness. In 8 patients both ovaries were removed and most of these developed their tumor in the cervix some time after the operation. Many were in the menopause age at the time of the removal of the ovaries, but one being under forty-two years. The cancer in the stump developed from 6 to 23 years after removal of the ovaries. Eleven patients, or 46.1 per cent, had had the menopause before the cervical cancer developed. This is higher than the usual percentage of the menopause in most series of cervical cancers. The significances of castration or the menopause are hard to correlate, but they add another factor to nonfertility or "unused uterus" and fibroids. The presence of five ovarian cysts of a nonmalignant type also must be of some importance when grouped with the other findings.

The symptoms of a malignant tumor in the cervical stump began in many different yearly intervals from the time of the original operation. One occurred at the end of one year and 2 in two years, and all 3 of these could be properly excluded from true cancer of the stump as the tumor was probably present before the hysterectomy was done. But an arbitrary limit of one year was set and must therefore be lived up to. Between four and six years 12 patients developed cancer, at eight and nine years, 1 each, and from eleven to twenty-three years, 9.

The extent of disease shows that 7 were in the A and B, or operable, groups of the American College of Surgeons Classification and that 19 were in the inoperable, or C and D, groups. Sixteen tumors were of the epidermoid variety and 4, or 15 per cent, adenocarcinoma (a high percentage of this type of cervical tumor). This latter figure might indicate that adenocarcinoma of the body was present at the original operation a much more likely explanation than that this type of tumor is more common in retained stump cases. However, adenocarcinoma did develop in two patients who had no children, and this type of tumor might be more likely in undamaged cervices than the epidermoid variety. In 6 instances the type of tumor was not classified, the pathologic report simply calling the tumor carcinoma.

The treatment consisted of radium in 10 instances, with 2 patients alive for one year and eight months and four years, respectively. Radium and x-ray treatment in combination were used in 8 cases and 5 patients are still alive, 4 very recent ones (too recent to count) and 1 with disease for two years. There were 2 cauterizations of the cervix (one with the Percy cautery) and both are dead. One abdominal cervicectomy of the Wertheim type was done and the patient has succumbed, and of the 2 vaginal cervicectomies one is alive without disease

for five years and six months. Two of the living patients were of the A group, that is confined to the cervix, and two in the C group, or cancer with suspected extension to the broad ligaments. One of the living patients had adenocarcinoma and the other 3 epidermoid carcinoma. Five patients developed fistulas following treatment. Of the living patients 3 had but 1 child, 1 had no children, and all 4 had fibroids. Thus it can be seen that a salvage of 7.6 per cent of patients alive for four years is much less than would be expected in a series of cancers of the cervix.

This group teaches us that nulliparous cervices are dangerous when left after supravaginal hysterectomy and that the badly lacerated cervix is not the only potentially dangerous cervix. It is obvious that patients with fibroids are quite susceptible to cancer of the cervix. Careful inspection, therefore, of the retained cervix is important after all supravaginal hysterectomies.

DISCUSSION

Because there were so few real cases of cancer of the cervical stump in comparison to the total number of cancers of the cervix in a large general hospital and in a large State Cancer Hospital further investigations seemed to suggest themselves. It is not possible to determine the percentage of cancer of the cervix in a given population because in vital statistics carcinoma of the cervix and body are included under a single heading, carcinoma of the uterus. It is also not possible to determine the accurate incidence of cancer of the retained cervix by following up each patient after a supravaginal hysterectomy because all patients would have to be followed for at least twenty-three years (as one of our patients did not develop cancer until twenty-three years after the hysterectomy) and such a study would be impossible. Further it would be interesting after discovering the percentage of incidence of cancer of the cervical stump following supravaginal hysterectomy to know the difference in mortality between total or panhysterectomy and subtotal or supravaginal hysterectomy. In the Massachusetts General Hospital series these figures are as follows: 224 total hysterectomies with a mortality of 4.4 per cent, and 1,771 supravaginal hysterectomies with a mortality of 2.9 per cent, a difference in mortality of 1.5 per cent or more than twice the incidence of cervical stump cancer in the same hospital (see below). There are many advocates of total hysterectomy, and in view of our findings, it would be interesting to know the mortality and morbidity of total hysterectomy in the hands of various operators. Do these surgeons advocate it only for patients with a badly torn or infected cervix when hysterectomy is indicated? The fact that so many of our patients were nulliparas or had had only one child makes it seem necessary for the advocates of total hysterectomy to advise it in *every* case. Total hysterectomy is certainly not advised in every nullipara, and yet, according to our study, it should be.

TABLE I. SUPRAVAGINAL VS. TOTAL HYSTERECTOMY

		TOTAL	MORTALITY	SUPRA-VAGINAL	MORTALITY
I	Masson (Mayo Clinic) 1926	229	1.3	217	1.8
II	Fullerton and Faulkner	1078	4.1	609	4.4
III	Mayo Clinic—1928*	219	0.45	251	0.79
IV	Essen-Möller†	117	6.9	799	2.0
V	Graves			1399	1.57
VI	Bartlett and Simmons‡	137	5.1	2733	1.7
VII	Burch and Burch			166	4.2
VIII	Massachusetts General Hospital	224	4.4	1771	2.9

*Group III from the Mayo Clinic are benign lesions.

†Group IV Essen-Möller's cases are fibroids.

‡Group VI from the Free Hospital for Women in Brookline are benign lesions except for leiomyosarcoma.

There seems to be nearly unanimity of opinion regarding the hazards of total as compared to supravaginal hysterectomy. A few quotations from various writers upon this subject show the feeling better than the figures because tables and figures (see Table I) do not always tell the whole story. For instance, many surgeons do total hysterectomies only when they consider the patient a suitable risk, and the supravaginal operation when the risk is great and a quick operation is necessary. Serious pelvic inflammatory cases and necrotic tumors, cases carrying a high mortality are much more likely to be operated upon by the supravaginal method than by the total unless the patient is an exceptional risk. In many cases nulliparas with normal cervices are operated upon by the supravaginal method. Figures show very little difference in mortality between the two operations but figures do not tell the whole story of the types of cases included in each series. The table's importance is the comparison between various surgeons' figures rather than the difference in mortality between the two operations.

Fullerton and Faulkner, writing on the subject in 1930, state that "although it is true that malignant conditions may develop later in the cervical stump, the risk is certainly no greater, than such disease occurring in the cervix of any woman, if as great (see page 364). The probability of such occurrence is not to be compared with the added danger and risk of the more severe operation; so that, in our opinion, the cervix, unless the seat of an intractable resistant chronic infection, or suggestive of cancer, should be treated conservatively and not removed at operation. Trachelorrhaphy, cauterization, or even low amputation when indicated, will nearly always leave the cervix in a satisfactory condition. It is true that in a few cases a troublesome leucorrhea may persist, but this will almost invariably yield to cautery treatment." This was written in spite of the fact that their mortality figures for total hysterectomy are better than their figures for the supravaginal operation. Their postoperative complications, however, are enlightening: 18 fistulas (only 3 operations for cancer) among the total hysterectomies and none for the subtotal type, cystitis twice as common, and hemorrhage more common.

Richardson, the originator of an excellent method of total hysterectomy, begins a paper on this subject as follows: "in sponsoring a new and simplified technic for total removal of the uterus by the abdominal route, I wish to go on record as being emphatically opposed to the adoption of this more radical operation as a routine procedure whenever hysterectomy is indicated. Unless it can be clearly demonstrated that the cervix is the seat of menacing pathology, I am convinced that for benign disease of the uterus it is both saner and safer to perform subtotal hysterectomy. The rare incidence of carcinoma in a normal cervix left in situ is a negligible danger compared with the morbidity and mortality that would necessarily follow the universal adoption of routine panhysterectomy by any method." His words are of great value and should carry a convincing appeal to most surgeons. Masson writing for the Mayo Clinic advises a careful selection of cases for the more radical operation. He writes as follows: "If total hysterectomy is performed only in simple cases, and no attempt is made to remove the cervix at the primary operation if there is inflammatory disease of the adnexa or degeneration in a low-lying fibroma, or if the patient is obese, the risk should be but little more than that of supracervical amputation. On the other hand, if total hysterectomy is performed only in the complicated and difficult cases, especially those in which there are complications as the result of inflammatory disease, the mortality, and morbidity will be much higher. Myomectomy should be performed during the childbearing period in preference to either of the more radical procedures when it is practicable, but if tumors are multiple the former may be more difficult, and in some cases in which the cervix is in good condition it is advisable to remove the uterus by the supracervical method."

These quotations have a great similarity and most important is the opinion that the healthy cervix may be left in place. The figures of the present paper, however, show that it is impossible to determine when a cervix is safe from the possibility of later development of cancer even the nulliparous.

Figures and percentages arrived at from a study of material of the Massachusetts General Hospital are illuminating. There were 39,930 married women over the age of thirty admitted to the hospital wards for all reasons from June, 1900 to June, 1933 and there were 751 patients with cancers of the cervix admitted to the hospital in the same period of time. Thus in this population the incidence of cancer of the cervix is 1.8 per cent. It is possible that a general hospital population is not a representative group, but it is one way to obtain accurate figures. In the same thirty-three years there were 1,774 supravaginal or subtotal hysterectomies (excluding ones done for cancer in any form or patients with amputation of the cervix) performed in the hospital, and in this period of time there were in the hospital but 13 cases of real cervical stump cancer, or 0.73 per cent. As the Massachusetts General Hospital receives patients from all the New England states, and as many of the worst and most difficult problems reach there, it is reasonable to assume that it would admit more cancers of the cervical stump from other hospitals than it would lose following its own hysterectomies. This seems a fair way to gage the occurrence of a tumor whose real incidence it is impossible to obtain by follow-up for reasons stated above. This figure,

0.73 per cent, is less than one-half of the percentage incidence of cancer of the cervix. In other words cancer of the retained cervix is not more likely after subtotal hysterectomy but from our figures one-half as likely as in women as a whole! In a ten-year series previously studied by the same method at the same hospital, the incidence of cancer of the cervical stump was found to be 0.9 per cent, only slightly higher. For the advocates of total hysterectomy to maintain their position it would be necessary for them to show not over a 0.73 per cent difference in mortality between subtotal and total hysterectomy. This *might* be accomplished by an operator well trained in this type of surgery, but to advocate total hysterectomy to all surgeons throughout the country in all patients to prevent the occurrence of cancer in the cervical stump would be the cause of far more deaths in an attempt to prevent cancer than would die of cancer itself. It is also obvious that total hysterectomy cannot be advocated in only special groups of cases, but it must be advocated in *all*, even those who have had no children.

SUMMARY

The most important considerations are the large percentage of nulliparas developing cancer of the retained cervix, the large percentage of cases with fibroids in the series, and the very small percentage of occurrence of this cancer as compared to the general impression in the literature of today. Conservative surgery should be the rule, and the life of the patient the most important consideration.

There is no doubt, and no one will deny it, that total hysterectomy is a more formidable and more serious operation than simple subtotal removal of the uterus. The morbidity, the chance of injuring the ureters and bladder, the possibility of vaginal prolapse and the foreshortening of the vagina in the young married woman all are against this operation as a routine.

The proper method of attack in cases needing hysterectomy is to carefully inspect the cervix in lithotomy position, and to curette at least the endocervix in the young and the whole uterus in the old. If the cervix looks suspicious it should be repaired, amputated, or biopsied, and no further operation should be done until a frozen section has been made, but if no pathologist is available for a frozen section, it is better to wait three or four days for a laboratory report and the presence or absence of cancer determined. The curettings should, of course, be subjected to examination. If cancer is present the proper procedure can be outlined, such as total hysterectomy, total vaginal hysterectomy, or radium. If no cancer is present a subtotal removal of the uterus can be done with ease of mind and the knowledge that the very best treatment had been outlined for the patient. A diseased cervix should never be left untreated; it should be removed or repaired by whatever means the individual surgeon is best fitted to do it, either by amputation, repair,

or total hysterectomy. Cauterization is a safe procedure also, and it is perfectly sound to rely upon it if it is done thoroughly and deeply enough. The author does not advocate total hysterectomy routinely but does advocate it in those cases where repair or amputation is difficult and where cauterization is out of the question. The doing or not doing of a total hysterectomy is up to the individual surgeon and to his study of the individual case, and no dogmatic rules can be laid down. Too much serious criticism of subtotal hysterectomy and too much enthusiasm for the total operation can and will of necessity cause an increasing number of deaths and many invalid patients.

The work of Hinselmann and Schiller in enabling the surgeon earlier to detect leucoplakia in its various types by the use of the colposcope and Lugol's solution should aid in the proper selection of cases for total removal of the uterus. Certainly leucoplakia, although not always developing into cancer, is a precancerous lesion. It occurs in the unmarried as well as the married and proper recognition of such cervices might lessen the incidence of cancer and thus save many more lives than routine total hysterectomy and its accompanying mortality.

CONCLUSIONS

1. In approaching pelvic surgery, inspection of, Schiller test of, and colposcopic examination of the cervix are necessary parts of the physical examination.

2. Careful examination of the cervix in the operating room before deciding the type of operation to be performed is essential.

3. Total hysterectomy cannot be advocated in every case, but it should be if the reasoning of its proponents is correct. Supravaginal hysterectomy should not be advocated for every case, as a badly lacerated and infected cervix is a menace. The decision should be made by the individual operator in each individual case.

4. Nulliparous cervices are dangerous and especially so are the cervices left behind in nulliparas who have had fibroids.

REFERENCES

Bartlett, Marshall K., and Simmons, Fred A., Jr.: Surg. Gynec. Obst. **55**: 777, 1932. *Burch, J. C., and Burch, L. E.:* Am. J. Obst. & Gynec. **21**: 704, 1931. *Counseller, Virgil S.:* Surg. Gynec. Obst. **50**: 644, 1930. *Essen-Möller, Elis:* Surg. Gynec. Obst. **46**: 187, 1928. *Farrar, Lilian K. P.:* Surg. Gynec. Obst. **60**: 826, 1935. *Fullerton, W. D., and Faulkner, R. L.:* J. A. M. A. **95**: 1563, 1930. *Graves, Wm. P.:* Am. J. Obst. & Gynec. **12**: 217, 1926. *Masson, J. C.:* Collected Papers of Mayo Clinic **19**: 522, 1927. *Meigs, Joe V.:* Tumors of the Female Pelvic Organs, New York, 1934, The Macmillan Company. *Phaneuf, Louis E., and Belson, Maurice O.:* Am. J. Obst. & Gynec. **25**: 262, 1933. *Von Graff, E.:* Am. J. Obst. & Gynec. **28**: 18, 1934.

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Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

Forty-Eighth Annual Meeting, Skytop Lodge, Pa.

September 16 to 18, 1935

The President, Dr. Marvin P. Rucker, of Richmond, Va., in the Chair.

The following papers were presented at the various sessions and except as noted are published in the current issue of the JOURNAL.

Fibrosis of the Placenta. Dr. Thaddeus L. Montgomery, Philadelphia, Pa. (For original article, see page 253.)

Direct Heat in the Treatment of Cervix Uteri. Dr. B. R. McClellan, Xenia, Ohio. (For original article, see current volume of the Association's Transactions.)

Mucocele of the Vermiform Appendix. Dr. Walter T. Dannreuther, New York, N. Y. (For original article, see page 342.)

The Reduction of Mortality in Ectopic Gestation. Dr. Charles A. Gordon, Brooklyn, N. Y. (For original article, see page 280.)

Intraspinal Alcohol Injections and Sympathectomy for Pain Associated With Carcinoma of the Cervix. Drs. J. P. Greenhill and Herbert E. Schmidtz, Chicago, Ill. (For original article, see page 290.)

The Treatment of Acute Pancreatic Necrosis. Dr. L. F. Smead, Toledo, Ohio. (For original article, see current volume of the Association's Transactions.)

Clinical and Pathologic Differentiation of Certain Special Ovarian Tumors. Drs. Emil Novak and L. A. Gray, Baltimore, Md. (For original article, see page 213.)

Premature Separation of the Placenta Encountered in Private Practice. Dr. R. F. DeNormandie, Boston, Mass. (For original article, see page 325.)

Vesicovaginal Fistula. Dr. L. E. Phaneuf, Boston, Mass. (For original article, see page 316.)

Cautery Excision of the Carcinomatous Breast. Dr. James F. Percy, Los Angeles, Calif. (To be published in the current volume of the Association's Transactions.)

Wheat Germ Oil (Vitamin E) Therapy in Obstetrics. Drs. E. M. Watson and W. P. Tew, London, Ont., Canada. (For original article, see page 352.)

A Brief History of Obstetrics and Gynecology in Virginia. (Presidential Address.) Dr. M. P. Rucker, Richmond, Va. (For original article, see page 187.)

Massive Blood Transfusions During Abdominal Operations. Drs. B. Z. Cashman and M. H. Baker, Pittsburgh, Pa. (For original article, see page 240.)

Pelvic Inclination. Drs. A. Y. P. Garnett and J. B. Jacobs, Washington, D. C. (To appear in the March issue of the JOURNAL.)

Uterine Bleeding. Drs. A. J. Rongy, A. Tamis, and H. Gordon, New York, N. Y. (For original article, see page 300.)

Operative Treatment of Urinary Incontinence. Dr. Marion Douglass, Cleveland, Ohio. (For original article, see page 268.)

Intermediate Repair of Injuries Resulting from Childbirth. Dr. S. E. Tracy, Philadelphia, Pa. (For original article, see page 333.)

The Effect of Excessive Cigaret Smoking During Pregnancy. Dr. A. M. Campbell, Grand Rapids, Mich. (To appear in the March issue of the JOURNAL.)

Sterilization of the Female by Coagulation of the Uterine Cornu (Motion Picture). Dr. Mortimer Hyams, New York, N. Y. (This procedure was described and published in the Transactions of the Association for 1934.)

Maternal Mortality and Maternal Mortality Rates. Dr. James Young, London, England. (For original article, see page 198.)

Subphrenic Collection of Lipiodol Following Injection into Fallopian Tube With Observations on Reverse Gravitation of Pelvic Exudates and the Genitophrenic Syndrome in Women. Dr. I. C. Rubin, New York, N. Y. (For original article, see page 230.)

The Effects of Radiation on Human Offspring. Drs. James R. Miller, Hartford, Conn., and J. A. Corscaden and James A. Harrar, New York, N. Y. (To appear in the March issue of the JOURNAL.)

The Use of Corpus Luteum in the Treatment of Dysmenorrhea. Drs. Ralph E. Campbell and F. L. Hisaw, Madison, Wis. (To appear in the March issue of the JOURNAL.)

Occipitoposterior Positions. Dr. S. A. Cosgrove, Jersey City, N. J. (To appear in the March issue of the JOURNAL.)

Carcinoma of the Retained Cervix of Subtotal vs. Total Hysterectomy. Dr. J. V. Meigs, Boston, Mass. (For original article, see page 358.)

Pelvic Measurements in the White and Colored Female for Comparison. Dr. W. T. Pride, Memphis, Tenn. (To appear in the March issue of the JOURNAL.)

Abscess of the Ovary. Dr. W. T. Black, Memphis, Tenn. (To appear in the March issue of the JOURNAL.)

George Gellhorn

It is with deep regret that we announce to the readers of the JOURNAL the death of George Gellhorn, a member of the Advisory Editorial Board since its inception as well as a frequent contributor to its pages, January 25 in St. Louis.

(*Strauss Studio*)

GEORGE GELLHORN
1870-1936